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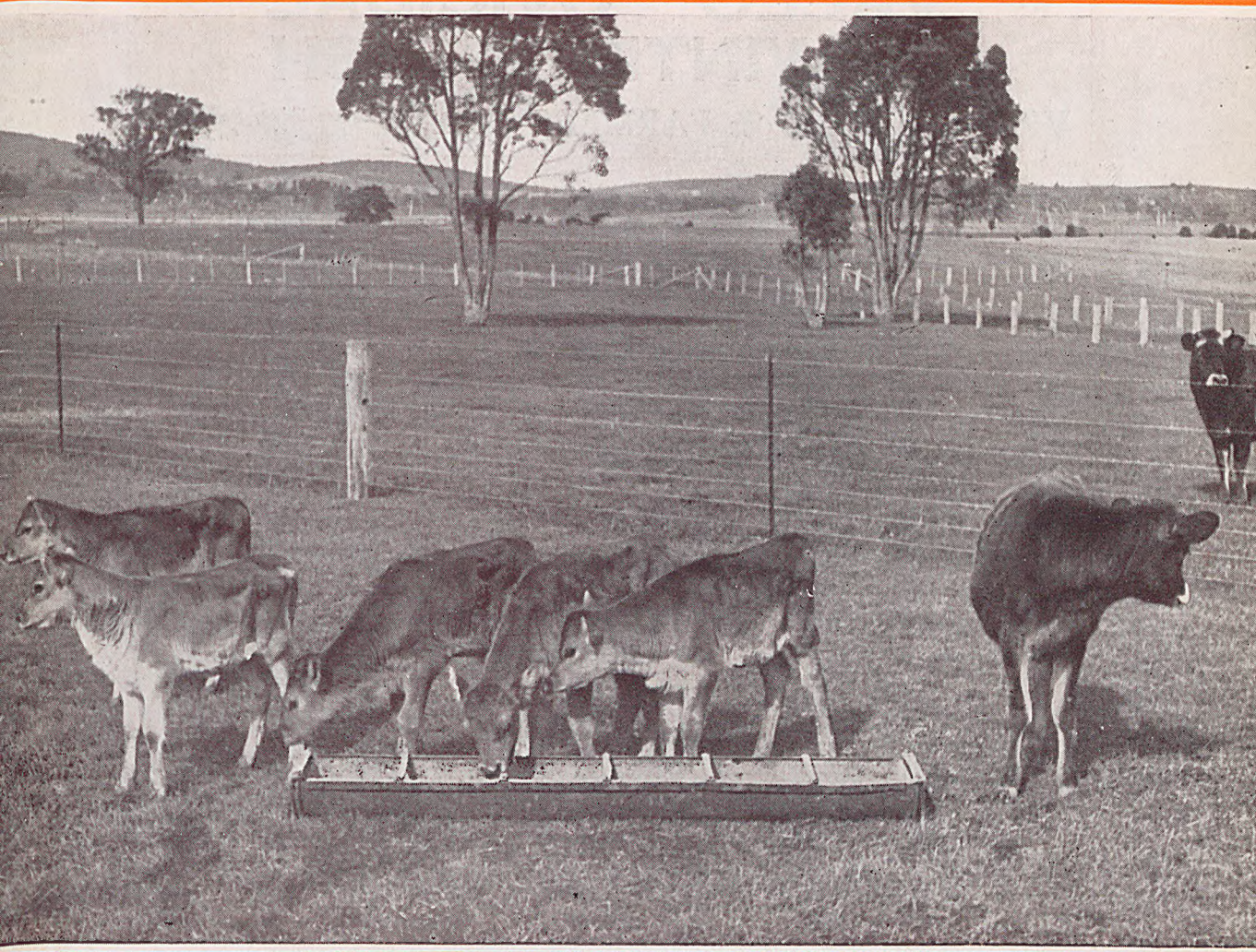

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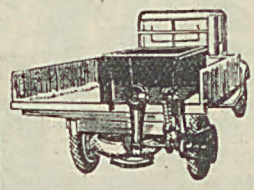

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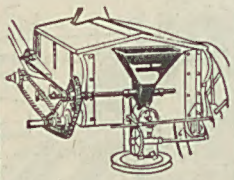

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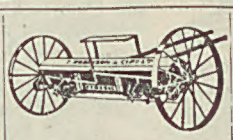

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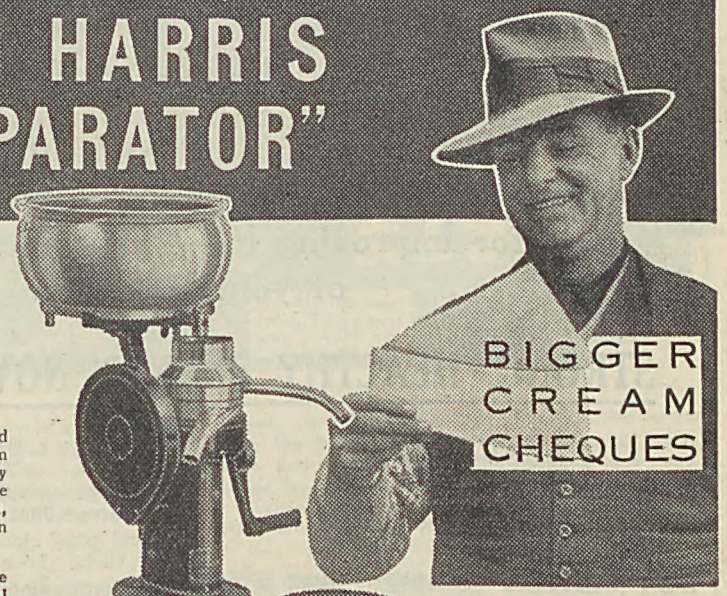

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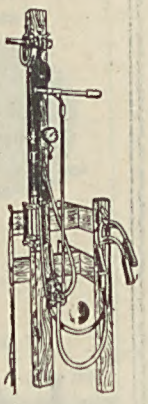

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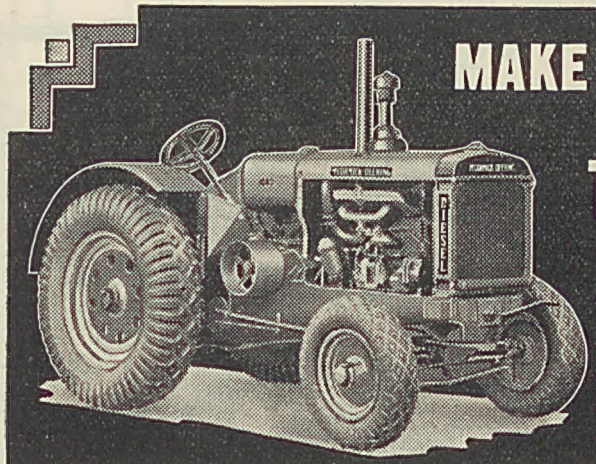

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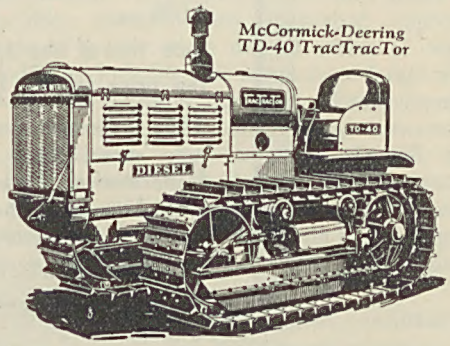

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

Mould in Citrus Fruits

Suggestions for Control

[The following is a report issued by the Citrus Preservation Technical Committee after an intensive survey of citrus packing houses of New South Wales, Victoria, and South Australia. This Committee is composed of representatives of the above State Departments of Agriculture and the Council for Scientific and Industrial Research. The investigations are being carried out by officers of these bodies working in co-operation.]

A SURVEY of citrus packing houses of New South Wales, South Australia, and Victoria, which was made towards the end of 1935, disclosed that methods employed in the handling of the fruit and in the maintenance of shed hygiene do not generally conform with accepted standards. Further, such methods are directly responsible for wastage losses, not only in export fruit, but also during the comparatively short period in which fruit is held for local market. The purpose of this report is to bring to the notice of shed managements some of the more obvious faults of every-day occurrence, together with suggestions for their elimination.

TYPES OF WASTAGE.

Wastage in citrus fruits marketed locally is chiefly due to green mould (*Penicillium digitatum*) and to a lesser extent to blue mould (*Penicillium italicum*). These moulds are familiar to every one engaged in the citrus industry and need no description. Blue mould is said to be capable of infecting fruit by contact even if the rind is unbroken, but both blue and green moulds gain access to the fruit usually through wounds. The rind is the normal barrier to infection and when wounding occurs, as so frequently happens, within the packing shed, the path for infection is provided.

The *Penicillium* moulds are fungal parasites which are disseminated in the atmosphere by means of spores (the equivalent of seeds in the higher plants). The cloud of dust that arises from a mouldy orange when disturbed represents myriads of spores, each one of which is capable of producing wastage if it happens to lodge within the wounded tissue of the rind. The presence of one mouldy orange is sufficient to contaminate the atmosphere of a packing shed. It will, therefore, be obvious that the method of storing mouldy fruit in bins within the shed, until such time as it is disposed of, is likely to result in all wounded fruits being exposed to heavily contaminated atmospheres.

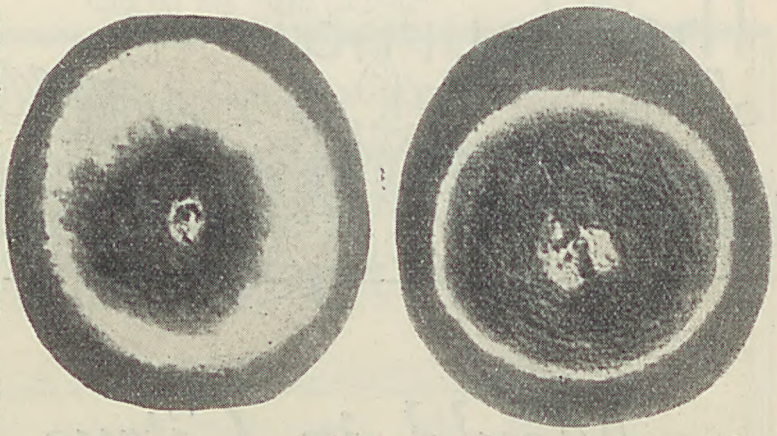
It will be appreciated that three conditions are necessary before mould wastage can occur—

(1) The rind must be injured;
(2) Mould must be present in the form of spores in the atmosphere; and
(3) Conditions of storage must be suitable for development of the rot.

NOTE.—It should be realized clearly that, although in this report the subject of packing has not been dealt with, improper and unskilful packing of fruit for market is probably one of the main contributing factors to citrus wastage. Readers are referred for information on this subject to the packing charts and articles issued free by the Victorian Department of Agriculture.

If any of these factors could be entirely eliminated, mould wastage would be reduced to a minimum. The reduction of all three factors to a minimum should be attempted and it is proposed to show in turn just what is the present status of the industry in regard to each and what precautions may be adopted to ensure that wastage may be kept within reasonable limits in the future.

When fruit is exported overseas or held locally in cool storage, wastage is due in part to the *Penicillium* moulds mentioned above and, in addition, to certain non-parasitic injuries to the rind. The latter take the form of sunken or unsunken discoloured areas of unsightly appearance, and frequently become mould infected when held in store for any length of time. The majority of the blemishes occurring in cool store come within the category of "storage spot." There are indications that "storage spot" can be controlled at least in part by the suitable adjustment of storage temperature, but since oranges from some districts are more susceptible to the trouble than those from other areas, it follows that the treatment which they receive prior to storage is of importance.

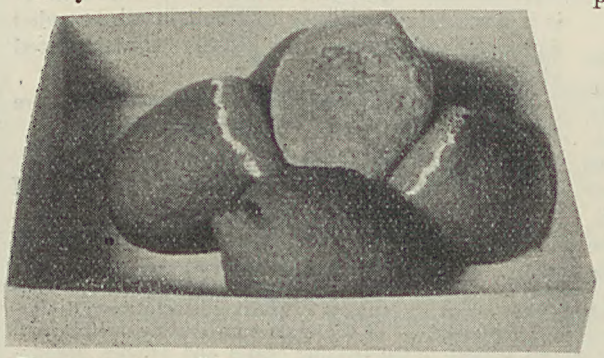


Left.—Common green mould due to **Penicillium digitatum,** *and Right.—Blue contact mould due to* **P. italicum,** *on oranges.*
[After Fawcett & Lee.]

Injury to the Rind.

From Picking to the Packing Shed.

Care in handling of citrus fruits has been emphasized on numerous occasions, and no doubt many of the suggestions for improvement have been put into practice for longer or shorter periods with varying success. It is essential that all suggestions should be practised all the time if noteworthy results are to be obtained.



Blue contact mould on lemons spreading by contact.
[After Fawcett & Lee.]

Citrus fruits are initially subjected to wounding at picking time. The practice of pulling is usually detrimental to the storage life of the fruit and is frequently responsible for extensive tearing on the rind in the vicinity of the button. At the same time, it is not suggested that this method should be universally condemned, since the main consideration is the length of time for which the fruit is required to be kept. Pulling is a reasonable and economic practice where oranges are to be consumed within a week, but beyond that time, especially when atmospheric conditions are favorable for mould growth, the grower stands to lose far more through mould wastage than the cost incurred by picking with *gloves and clippers*. Where the latter method is employed it is necessary that the gloves should be in good condition and particular care must be taken to avoid injury to the rind by the careless handling of the clippers.

It is important to see that *aprons* are in good order and free from sand, grit, and other foreign matter. The presence of abrasive particles in the picking apron can cause quite an amount of damage which will be augmented by transference with the fruit to the picking boxes.

Investigations into the sources of wounding have shown that with normal care the amount of damage inflicted up to the time the fruit is placed in the picking boxes is comparatively slight. The most important period is from this point until the fruit is delivered at the packing house. This does not mean, however, that handling at the shed is a relatively unimportant matter, as will be seen subsequently.

It is quite essential that the *picking box* be well constructed and free from splinters and protruding nail heads and points. The internal

Citrus groves in a prosperous citrus district.

surfaces of the box should be smooth finished to avoid friction with the fruit during transport. If boxes complying with these specifications are in use, it is still more necessary to see that they are maintained in the same condition. Both the life of the box and its efficiency are affected by the manner in which it is handled and employees should be made acquainted with this aspect of the problem.

The common method of laying out the picking boxes on the ground prior to picking is to be deprecated. The practice invariably introduces soil to the box and its presence more than neutralizes the care and expense bestowed upon a well-made picking box. It is not a difficult matter to provide a couple of lengths of 3″ x 2″ timber upon which the picking boxes may be placed. Alternatively, bags may be spread beneath the boxes to prevent the ingress of sand. In the United States of America it is usual for pickers to be provided with a small whisk broom by means of which the boxes may be brushed clean before picking commences.

A very common source of wounding is that due to overloading of picking boxes. A clear margin of at least 1″ should be allowed in every case to prevent bruising and crushing by the overlying boxes. Movement of the fruit in the case should be reduced to an absolute minimum during transport, and this may be done only by having regard to the size of the load, efficiency of springing, and the avoidance of rapid travel where the road surface is imperfect. A very effective method of reducing the "rub" type of injury which results from friction between fruit and box is to place a thin layer of wood wool in the box prior to picking. This practice also serves to protect the fruit from gritty particles, small pieces of dead wood, &c., which find their way to the bottom of the case during transport. Normal care should be exercised when loading the fruit on the truck and similarly during unloading at the shed. The use of a tarpaulin is advisable to keep the load steady and the fruit clean.

The Packing Shed.

The supervision of handling methods up to the time fruit is delivered at the packing house may be thought to devolve upon the grower except where gang pickers are provided by the shed organization. This is not entirely the case, since the reputation of the shed product depends in large measure upon the history of the fruit in the early handling stages. It is, therefore, incumbent upon the packing house management to ensure, both by publicity and personal instruction, that the methods advocated in this report are generally practised.

At the same time, it must be realized that packing-house managers are not in a position to offer advice unless operations under their immediate control are above reproach, and this unfortunately is not always the case. The modern citrus packing house should be maintained in as

scrupulously clean condition as is any other establishment handling food products for human consumption, and this not for mere outward form, as will be seen later. Apart from this aspect, great care should be paid to the individual units of the shed equipment which, if allowed to deteriorate, may easily be the cause of monetary loss many times in excess of the value of the unit.

Probably the most important part of the entire outfit is the *hopper* or feeder, into which the fruit is tipped prior to passing through the plant. The hopper is commonly protected both on the floor and sides to lessen injury. Sponge rubber is frequently used as the protective agent, but since its period of usefulness is not indefinite it is quite common to see unprotected tack heads standing well out from the surface of the covering material. Many instances could be quoted of dangerous imperfections in this unit. The object of this report, however, is not a critical review of existing conditions, but rather to make constructive suggestions for improvement. Most of the faults observed are not due to negligence on the part of the management, but rather to an incomplete understanding of the very serious danger which they constitute, and once this is fully realized an intelligent application of the ideas outlined herein will result in the elimination of the obvious points of wounding.

It is difficult to avoid the accumulation of sand and dead twigs on the floor of the hopper, since this is transferred with the fruit, and the presence of such material, as is the case with the field box, neutralizes the benefits which would otherwise be derived from the padded floor. For this reason it is suggested that the floor of the hopper should consist of a series of parallel steel bars protected by tubular rubber of suitable thickness.

From the hopper the fruit passes in turn through *a soaking tank*, over cleansing brushes, and then through a second tank containing a preservative solution of some type. Quite a number of cleansing agents are in use and the temperature of the solution depends upon local preference. Within reason, the higher the temperature the more efficient is the cleansing effect and immersion of fruit for five minutes at 100° F. must be considered safe under normal conditions. In fact, for maximum efficiency, both with regard to cleansing and sterilization, a bath temperature of 110° F. can be safely recommended except in the case of very early fruit and fruit processed towards the end of the season, in which case some rind browning may occur. The provision of thermostatic control of the solution temperature is desirable.

The rind of the orange is readily injured by contact with *dry brushes* and it is necessary to see that these are sprayed for at least five minutes

Much damage is occasioned in the citrus packing house unless the greatest care be exercised in the actual handling of fruit and in the careful supervision of those parts of the machinery with which the fruit comes in contact.

before scrubbing is commenced. Injury of this type is not visible to the naked eye, but becomes apparent on the application of dyes to the surface of the fruit.

After leaving the tanks the fruit is drained free of excess moisture and dried either in an air tunnel or by means of towelling. The latter method is not satisfactory, partly because the towelling rapidly becomes saturated when it is no longer efficient, and partly on hygienic grounds, since an unlimited supply of towelling would be required if fresh material were to be used frequently.

Wherever the fruit passes along by means of a moving conveyor, e.g., in the air tunnel, there is a tendency for it to rub along the sides of the plant. This effect is magnified by the rotation of rollers. Wounding may be eliminated by frequent inspection and the sand-papering of roughened surfaces or preferably by the provision of a rubber flap on either side along the entire length of the conveyor.

Leaving the dryer the fruit is usually polished, graded and sized. These operations cause but little injury to the fruit if the units are maintained in good order. In some types of sizer the drop into the bins is excessive, a fault which may be detected by the presence of oil stain on the canvas.

A suitable method of joining up the separate units of the shed equipment does not appear to have been, as yet, evolved. In many cases the junction is fashioned from sheet galvanized iron, and while this provides satisfactory service for some time, it tends eventually to lift at the edge and is then responsible for a large amount of wounding.

When oranges are wounded at any point in the plant, a small amount of oily exudate is deposited which accumulates dust. Repetition of the process builds up a series of sharp excrescences known as "dirt knobs". These may be removed by scraping with a blunt instrument.

A daily inspection of the shed plant is strongly advocated and may be quickly and effectively carried out by running the hands carefully along the entire route traversed by the fruit. This procedure adds very little to the working cost, but will be the means of saving money for the shed management and for the grower.

The figures set out in Table I., derived from an investigation into the sources of wounding carried out by the Citrus Preservation Technical Committee in Australia, indicate the extent of wounding in oranges at three points, viz., during picking, during transport to shed, and in passage through the shed plant. Wounds were rendered conspicuous by immersing the fruit in separate solutions of tannin and ferric chloride when even minute abrasions were indicated by a black deposit within the affected area.

The use of gloves and blunt-nosed clippers is accepted as the best practice in harvesting oranges for export or storage.

TABLE I.—SHOWING EXTENT OF WOUNDING IN ORANGES DURING PICKING, TRANSPORT TO SHED, AND PASSAGE THROUGH SHED PLANT. CASE COUNT = 124.

	Picking.	Transport.	Shed.	Total.
Clipper cut ..	4	0	0	4
Chip	0	5	12	17
Puncture ..	2	0	0	2
Scratch ..	6	0	9	15
Rub	12	37	32	81
Gash	0	0	1	1
Total ..	24	42	54	120
Percentage wounding	19	34	43	96

The fruit was picked with gloves and clippers, which probably accounts for the comparatively low percentage of wounding at picking. The rub type of wound, which consists in the removal of a more or less extensive circular area of superficial rind tissue, is due to friction with a rough surface. It was responsible for more than half of the total wounding recorded and is of the type that permits rapid infection since the external walls of the oil

TABLE II.—CITRUS PACKING TEST—SHOWING PROTECTION AFFORDED BY WOOD WOOL.

	1½ oz. Wood Wool.			2 oz. Wood Wool.			No Wood Wool.		
	Picking.	Transport.	Total.	Picking.	Transport.	Total.	Picking.	Transport.	Total.
Clipper cut	1	0	1	0	0	0	0	0	0
Chip	0	6	6	0	4	4	0	6	6
Puncture	4	0	4	4	0	4	6	0	6
Scratch	4	5	9	15	3	18	7	0	7
Rub	6	17	23	4	19	23	2	47	49
Total	15	28	43	23	26	49	15	53	68
Percentage wounding	15	28	43	20	22	43	12.5	45.5	58
	Case count = 100			Case count = 114			Case count = 116		

glands are removed and penetration by the mould organism via the glands is much more easily accomplished than through intergland tissue. The fact that only 4 per cent. of the fruit escaped wounding is direct evidence of the necessity for reform in handling methods.

That effective consideration can be given to the matter is shown by a subsequent experiment in which one lug box of fruit was treated as before, one was protected with 1½ oz. of wood wool spread evenly on the floor, while the third was similarly treated with 2 oz. of wood wool. The results achieved at this test are shown in Table II.

The trees from which the fruit was drawn bore a large amount of dead wood, hence the high proportion of scratch at picking. This is a matter for control by the orchardist and if wounding due to this source be omitted the figures for wood wool (average) and no wood wool are 34.8 per cent. and 58 per cent. respectively. The mere introduction of wood wool reduced wounding by approximately 40 per cent., which represents a very considerable decrease in the number of oranges that would be susceptible to mould.

A subsequent attempt was made to determine wounding due to shed plant both before and after the elimination of obvious points of injury. The test resulted in a net decrease of 33 per cent., making a total decrease of 73 per cent. in the number of fruits wounded. These figures demonstrate conclusively that wounding in commercial practice is excessive, and are sufficient recommendation in themselves for the need for radical alteration in present handling methods.

The more common sources of mechanical injury to the fruit may be summarized as follows :—

Orchard.

1. Projecting wires in picking bags.
2. Foreign matter in bags and field boxes.
3. Field boxes of rough wood or with projecting nails.
4. Pulled fruit.
5. Overloading of field boxes.
6. Fruit with excessively long stems.
7. Excessive speed of trucks on rough roads.
8. Care in loading fruit on trucks.
9. Tarpaulin cover during transport.

Packing Shed.

1. Condition of hopper.
2. Projections of various kinds and at various places in the plant, e.g., dirt knobs, projecting screws and nails.
3. Woodwork with sharp edges and splinters.
4. Sharp edge on conveyor belts.
5. Spinning fruit due to defect in machinery.
6. Unnecessary machinery.
7. Badly neglected sizers.
8. Excessive drop into sizer bins.
9. Excessive bulge on cases.
10. Careless lidding.
11. Broken lids.
12. Box nails dropped into cases of fruit.

The Presence of Mould.

We have discussed in the previous section the innumerable ways in which wounding in citrus fruits can occur and have also pointed out that wounding is a prerequisite to fungal wastage. For practical purposes it may be assumed that absolutely sound fruit is not generally liable to attack.

The second condition necessary to ensure mould wastage is the presence of the mould. This does not mean that given 100 per cent. incidence of injury in fruits and the presence of mould spores in the atmosphere or surroundings, 100 per cent. mould wastage will be encountered. It indicates

rather that all wounded fruits are liable to attack, but the percentage that actually becomes infected depends upon the degree of contamination or number of mould spores present. It is obvious that 50 mould spores could not immediately infect 100 wounds, but on the other hand it must be remembered that infection of a single orange will result in the reproduction within a very short time of sufficient spores to contaminate heavily the atmosphere of the packing shed. The lesson to be drawn is that, even though it is impossible to eliminate the presence of mould entirely, practices designed to reduce it in quantity will surely be followed by a corresponding reduction in the mould wastage experienced.

Many shed managers are under the impression that, if the " sterilizing " bath is effective in killing mould spores present on the fruit, no wastage will occur. It must be emphasized, however, that this procedure is almost useless if, after emerging from the bath, the " sterilized " fruit is again exposed to the contaminated atmosphere of the shed. Assuming that the fruit is wounded—and we are reasonably assured of 50 per cent. wounding in any packing shed under present conditions—mould spores again lodge on the surface of the processed fruit and are retained there by the wrap. The fruit is then placed with others in a case and the fungus allowed to develop under the most appropriate conditions of warmth and moisture.

Contamination on the Orchard.

Since wounding may occur at any time from picking to packing of the fruit, it is necessary at least to attempt to secure a reduction of mould contamination even on the orchard itself. Occasionally mouldy fruits are to be seen hanging on the tree and more frequently lying on the ground. These should be collected periodically and destroyed either by burning or by tipping into a fly-proof pit.

Gloves and aprons are potent sources of contamination and it is a common practice to leave a few oranges in the picking apron when it is thrown on one side. Gloves and aprons should be sprayed with a solution of chlorine (10 parts available chlorine per million) at the end of the day.

Picking boxes are commonly very heavily contaminated by mould as is evidenced by the green colour which they assume when in use for some time; a brief inspection of the stacked boxes at any shed will reveal their condition. Tanks containing boiling water, in which the cases may be immersed after each delivery, have been provided in a number of sheds. This process, while lethal to mould, may do harm if it loosens the nails by swelling and skrinkage of the timber. A safe and certain remedy is provided by steam sterilization after the manner of milk cans in the dairy factory. Granted that boxes are in a clean

Lowering oranges carefully from an approved picking bag into a good type of picking box. Note the lugs on the ends of the box to prevent injury to the fruit when stacked for transport to the packing shed.

Harvesting oranges efficiently.

condition when delivered at the orchard, it must be remembered that mould is commonly present on particles of organic matter in the soil, so that the introduction of soil to the box not only results in wounding but serves also to reinfect the box.

Contamination in the Packing Shed.

On arrival at the shed the fruit, particularly if required for export, is stacked for a period of *sweating*. During this operation a certain percentage of mould develops and extreme contamination of the packing house results. Sweating should, therefore, never be carried out in the packing shed or its surroundings. If sweating is considered necessary, the fruit should be stored in an isolated shed on the grove and at its conclusion all mouldy fruit removed before delivery to the packing shed. The sweating shed should be sprayed with chlorine solution before the next lot of fruit is stored. These remarks apply to some extent also to the *ethylene colouring chamber*. The provision of the necessary facilities and supervision, however, demands that this work should be carried out at the central shed. It is advisable in this case to see that the door of the colouring room does not open directly on to the space occupied by the shed plant from which the room should be isolated by a close fitting partition.

Perhaps the most important consideration is the avoidance of introducing even one single mouldy orange into *the plant* with the remainder of the fruit. During its progress each of the units in turn become infected and mould losses will be greatly exaggerated.

While some provision is generally made to ensure apparent cleanliness, many shed managers fail to appreciate the necessity for true hygiene, involving strict elimination of infective material from the shed and its surroundings. A glance under the plant, in sundry corners, in sweat boxes, and around the grounds in the vicinity of the shed reveals in many cases the presence of mouldy fruits in various stages of degeneration. In addition, there is often to be seen a pile of boxes containing wasty oranges held until such time as they accumulate in sufficient numbers as to form a suitable loan for the dump.

It is not practicable to remove each mouldy orange from the shed as it is found, but it is essential that it should be placed in a properly covered bin outside the four walls of the shed. Such waste as accumulates during the day's run should be tipped into a fly-proof pit, or alternatively, destroyed by burning. The practice of throwing waste fruit in an uncovered heap in proximity to an orchard cannot be too strongly condemned.

Having accomplished all that is possible to prevent the introduction of mould spores into the shed, it is still necessary to reduce that which will be present even when all logical precautions are taken. The best method of so doing is to wash the floor and plant nightly with ½ per cent. solution of caustic soda (a number of proprietary preparations are equally effective). The walls of the shed, canvas bins, polishing brushes, &c., which cannot be washed in this way should be well sprayed with solution of chlorine or with ammonical copper carbonate, 12 pints of ammonia (26° Baumé), 20 ounces of copper carbonate, and 100 gallons of water. The ammonia is first diluted with 2 gallons of water. The copper carbonate is made into a paste with water and slowly added to the diluted ammonia. Water is then added to make up 100 gallons. Office equipment, furniture, &c., where such is housed within the shed, should likewise be sprayed nightly with solution of chlorine.

The cleansing method here advocated has been thoroughly tested and shown to give a remarkable reduction in atmospheric mould contamination

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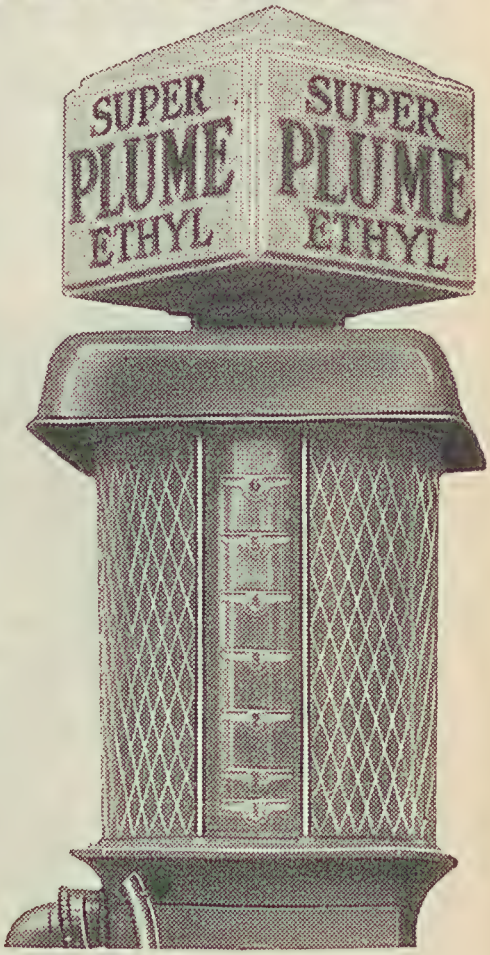

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within the shed. It is unfortunate that most of the Australian sheds were constructed before the importance of a very strict hygiene was realized, and hence do not lend themselves by reason of wooden flooring, &c., to the thorough cleansing that is required. It is recommended that, in the future, citrus packing house construction should be modelled upon the lines of a modern dairy factory, in order that correct sanitation may be fully accomplished in practice.

To sum up, shed contamination may be reduced below the danger point by (*a*) avoidance of unnecessary inoculum, (*b*) sanitation, as follows :—

Avoidance of unnecessary contamination—

1. Clean picking boxes, gloves, aprons, and clippers.
2. Soil contamination.
3. Sweating chamber.
4. Ethylene chamber.
5. Exclusion of mouldy fruits from plant.
6. Disposal of waste fruit.

Reduction of contamination by sanitation—

1. Washing with half per cent. caustic soda, or other suitable fungicide.
2. Spraying with solution of chlorine (10 parts available chlorine per million).

Conditions for Development of Mould.

Assuming injury to the fruit and the presence of mould spores within the wounded tissues, certain conditions yet remain before rotting can commence. Of these the most important is temperature. Humidity is normally an important factor in the germination of fungal spores, but in this case ample moisture is provided by the orange itself. The temperature-time relations for the development of mould in oranges has been investigated by Dr. R. G. Tomkins of the University of Cambridge, England. At a temperature of 75° F. an infected fruit will become appreciably rotted, i.e., it will develop a soft spot about 1 inch in diameter, after three days. Reduction of temperature will retard the development of the rot (see below) and at a temperature of 40° F. the fruit will resist the fungus for approximately 30 days.

Temperature-time relations for the development of rots in oranges are shown as follows :—

92° F.	75° F.	70° F.	65° F.	60° F.	55° F.	50° F.	45° F.	40° F.	
∝	3	4	5	6	8	10	16	30	days.

It will be seen from this table that Valencia oranges marketed during the summer merely require to be wounded in an atmosphere of contamination for wastage to occur on the local market. The figures also explain in part why mould wastage is far more prevalent in late than in early Washington navels.

It is not possible for the shed organization to control the temperature factor without the provision of cool storage. It has been discussed here merely to show the possibilities that exist in the matter of losses through mould wastage. If due regard is paid to the avoidance of contamination and wounding, the marketing of citrus fruits in Australia may be undertaken with confidence.

Apple and Pear Growers' Bounty

Closing date for receipt of claims 30th June, 1937

VICTORIAN apple and pear growers are reminded that forms to enable them to claim for bounty under the *Apple and Pear Bounty Act* (*No.* 2) 1936, have been available for some months at post offices in the apple and pear growing districts in Victoria.

Claimants must satisfy the Victorian Fruit Growers Relief Committee that they have exported or sold for export from the Commonwealth apples or pears of the 1935-36 season grown by themselves, and that such fruit was actually exported from the Commonwealth during the year ended 31st December, 1936.

Many claimants for the bounty have already received their cheques, and as the closing date for the receipt of claims is fixed by the Act as the 30th June, 1937, those growers who have not yet applied are urged to make early application. Claimants should follow the instructions given on the claim form, and share-farmers are requested to arrange that claims from both parties are lodged promptly.

Any further information required may be obtained from the Fruit Growers Relief Committee, 61 Spring-street, Melbourne, C.1.

Rochester Irrigated Pasture Competition, 1936-37

Report of Judge, A. Morgan, B.Agr.Sc., Irrigation Field Officer.

THE value of a late summer judging of pastures, in addition to the usual spring inspection, has been emphasized by the results this season. Treatment in respect of watering and grazing during the summer is a vital factor in determining the productivity and persistency of perennial grasses and clovers under irrigation in any district, and the length and severity of summer in the north ruthlessly exposes any faulty treatment and tests the efficiency of the layout to a degree not experienced at Werribee or Bacchus Marsh.

The holding of a field day at the same time gave a valuable opportunity for discussion of some of these problems. With one exception, the pastures entered were on the properties of men who have had considerable experience with permanent pasture, and it is now difficult to find any one not firmly convinced of the necessity for liberal manuring with superphosphate. Some difference of opinion as to the correct time for its application, and also as to whether it is advisable to give the dressing in two widely-spaced applications, is encountered, but there is general acquiescence in regard to the advantages of manuring at the rate of at least two bags of superphosphate per annum.

Watering and grazing still remain to be brought up to the high standard of manuring practised, however, and in the district there are still many irrigators who have not profited by the example of those who have produced high-grade pastures by careful attention to these factors. There is still the refusal to acknowledge what has been proved time and time again in careful tests of watering methods—that is, the value of supplementary waterings in the midsummer period. Compensation for poor penetration of water, by frequent light applications in midsummer, is not as efficient as where good penetration is ensured by supplementary watering, and the system has other advantages. For example, in an endeavour to complete the watering of the whole block in the five days "on," cows are often put on wet paddocks, and the result is that they bog up the sward and do considerable damage to the white clover. Another fact not appreciated fully is that the treatment of pastures which are being built up has to be more careful in regard to watering than on those where the dominance of "irrigation wild white clover" indicates that fertility has been brought up to a high level. These paddocks in almost every case represent the product of years of heavy manuring of lucerne preceding the pasture, and they are also a response to the better penetration of water, which is a proved fact on land liberally manured with superphosphate while growing lucerne. Some time ago the Senior Agrostologist (Mr. L. C. Bartels) had a trench dug through the "no manure" and the "super. 4 cwt." plots at Tongala, and the better penetration of water and the development of the roots of the lucerne on the 4-cwt. plot was outstanding.

Now that these "irrigation wild white clover" paddocks have developed to full production, as they have at Mr. D. Holman's, where the field day commenced, a single watering is sufficient to ensure a good penetration of water, and the heavy sole of pasture is also partly responsible for this; but for pasture on land not previously in lucerne, or where systematic heavy manuring has not built up a high fertility, a small stream should be run over the day following the ordinary watering, and cut off a little over half-way down the bay. If this practice is followed *for two or three waterings in the midsummer period,* the satisfactory penetration accomplished will be reflected in increased vigour of growth and in a greater staying power between waterings.

Another important point is the saving in water. This saving is shown in the results of trials at Werribee. The details can be seen in the 1936 Guide Book, but the essential facts are as follow:—Seventeen waterings applied for a total of 25 inches gave practically the same total yield, but at a higher water-cost per

ton of green feed produced, than in the case of nine waterings applied for a total of 22.4 inches. The average watering in the first case was 1.47 inches, and in the second 2.48 inches. The first was watered as required, and the second watered three-weekly with supplementary waterings. The average penetration at Werribee is not good, as the average watering of 1.47 inches shows, so that it is not correct for northern irrigators to claim that they are working under harder conditions in this respect than are encountered at Werribee. The point which requires emphasis is that the system of supplementary watering is invaluable to those who are experiencing trouble in securing a good penetration of water, and yet it seems that these men are the ones most intolerant of any change in watering technique.

Wherever sheep are run on irrigated pastures, there is a definite tendency towards overgrazing, and even where watering and manuring have been brought to a high standard this practice of overgrazing, if continued for any length of time, has a very bad effect on the pasture, particularly in regard to the clover content. On young pastures especially the development of ground cover is greatly retarded, and the influx of weedy grasses such as umbrella grass and love grass, and of an increasing percentage of subterranean clover, is rapid. Every farmer who has sown down the permanent pasture mixture knows that the white clover and cocksfoot require at least two years for substantial development, and where overstocking is practised the stock tend to selectively graze these species. Rye-grass is not a particularly palatable species, in comparison with white clover, and it is a bad policy, when endeavouring to graze down the rye-grass, to hold stock on the pasture until they have eaten the clover right back to the ground or even pulled up a big percentage of the runners.

Dairymen are careful to avoid this bad practice, as they will not risk a drop in milk, and change the cows around frequently to give them fresh, succulent fodder, but with sheep there is not the same careful study of the capabilities of the pasture. Fat-lamb raising and wool production on irrigated pasture will prove one of the best adjuncts to dairying under closer settlement, since it avoids the labour problem which is introduced once the dairy herd is increased above a certain strength, and avoidance of overgrazing will be one of the most important conditions for success.

It is not always the number of stock carried which causes the overgrazing. The period of rest between grazings must be regarded as of equal importance. An irrigated pasture receiving 2 feet of water and 2 cwt. of superphosphate will yield from 20 to 30 per cent, more feed in a year, when rested a month between grazings, than it will when rested only a week. A better balance of grass and clover, and a better ration in regard to digestible nutrients, are provided by the less frequently grazed sward. Another feature which makes sheep-grazing on irrigated pasture likely to be more severe, particularly in the winter period,

TABLE I.—ROCHESTER IRRIGATED PASTURE COMPETITION, SEASON 1936-37.

Exhibitor.	Layout and Condition of Channels.		Condition of Pasture.		Mixture.		Uniformity.		Freedom from Weeds.		Totals.		Grand Total.
	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(100)	(100)	
H. Schier, No. 1	19	16	18	19	18	19	19½	19	19	19	93½	92	185½
D. Holman	19	18	19½	18	18	15	19½	17	19½	19	95½	87	182½
Firth Bros. ..	19	18	19	16	19½	18	19	17	19	17	95½	86	181½
S. Paynter ..	19½	19	18½	17	19½	14	19	18	19	17	95½	85	180½
E. Watson, No. 2	19	18	19	18	16	12	19	16	19	18	92	82	174
H. Schier, No. 2	18	16	17	18	18	17	19	18	17½	14	89½	83	172½
E. Watson, No. 1	19	16	15	14	17½	15	19	17	19	15	89½	77	166½

is the limited hand-feeding as compared with that provided for dairy cows.

This season's competition was not well patronized, only five exhibitors being represented. The points for the spring and autumn inspections are shown in Table I.

The winner of the competition this year is Mr. H. Schier. His winning entry pays tribute both to careful management and to the sowing of the best procurable strains of grasses and clovers. The mixture sown was 8 lb. Hawke's Bay perennial rye-grass, 3 lb. Italian rye-grass, 3 lb. cocksfoot, and 1 lb. each of New Zealand wild white clover, white Dutch clover, alsike clover, and lucerne. Manuring at seeding was a bag of superphosphate to the acre, and this has since been increased to two bags.

The rye-grass is dominant in the pasture, but the cocksfoot plants are steadily developing, and a nice balance of grass and clover has been preserved up to date. The paddock was just a few days off the right stage for cow grazing, and was very free from weeds, considering the time of the year and the weed content of most other pastures in the district. A dairy herd in splendid condition testified to the quality of the green feed from this paddock and from other pastures on the property, and reserves of grass hay had been put up in addition.

At the autumn inspection the channels on practically all the properties visited were not in good order, owing to the vigorous summer growth of paspalum and "nut grass" (*Cyperus vegetus,* umbrella sedge), and this is excusable to a great extent because of the arduous period of watering which has been passed through. In the judging, however, seeing that we strive for the ideal, a loss of points on this feature was inescapable.

Mr. D. Holman's pasture, which claimed the second place, is becoming a "show" paddock of the district on account of the extraordinary growth of irrigation wild white clover which it carries. On an area of 50 acres the equivalent of 50 cows has been kept in high production, and from two cuts—one following the spring inspection and another at the end of December—50 tons of grass hay, or rather clover hay, was put up. This clover growth, which is becoming more common under irrigation, and can be seen at Dingee, Tongala, Bacchus Marsh, &c., has been produced on old lucerne stands by heavy superphosphate applications and by strict attention to summer watering to maintain a continuity of growth.

Although highly productive, the limited mixture barred this pasture from first place. It is obvious now that this feature will be corrected naturally in time, as the grass balance is becoming more satisfactory each year owing to the incursion of perennial rye-grass, paspalum, and prairie grass.

Those contemplating sowing this clover, or New Zealand wild white clover, cannot expect to reproduce the growth seen on Mr. Holman's paddocks unless they are prepared to raise the fertility of their fields by similar methods in regard to manuring and watering. Where pastures are sown on land not previously in lucerne the time necessary to build up the required fertility will be even longer, and, where the expense of seeding down pasture is an important consideration, there seems to be good reason to follow Mr. Schier's method and sow a proportion of white Dutch with the more expensive New Zealand or irrigation wild white. As soil conditions improve, the larger and more productive strain will assume more and more importance in the sward. Even on some of the most unattractive paddocks in the Rochester district, where umbrella grass and love grass predominate, small patches of the large-leafed strain of white clover are developing in spite of the handicap of hard, frequent grazings which deny them a reasonable period of recuperation.

School Plots.

It is pleasing to record the high standard of the school plots this year, and to see that suggestions for improvement have been so readily adopted. The teachers in some cases came to the schools to find the exhibits in a very run-down condition. They deserve every credit for their interest in a matter which is, unfortunately, outside the regular curriculum, and under their direction the pupils have put a great deal of work into the plots.

All the exhibits were in a condition which showed full appreciation of the necessity for regular cutting to maintain species in a pasture condition, and, with one exception, watering had been carefully attended to. The neatness of all the enclosures was outstanding.

The first prize this season goes to Nanneella West State School (see Table II.). The pupils and their headmaster, Mr. Seddon, have put up a great performance this year, considering that last year they were at the bottom of the list. In reply to a question as to two species suitable

for addition to the collection, it was suggested that *Phalaris tuberosa* and prairie grass should be grown.

Prairie grass has long been recognized as a palatable, nutritious grass, valuable for winter feed, but the ordinary commercial seed has not produced plants of the necessary persistency under grazing. A similar experience has been obtained with Hungarian Brome grass, *Bromus inermis*. Some time ago the Waite Research Institute requested the Werribee State Research Farm to forward seed from prairie grass in old cow pastures to add to their collection, and the opportunity was taken to have this seed tested at the Department's Plant Research Station at Burnley.

In comparison with other prairie grasses, this particular strain was outstanding in leafiness, recovery after cutting, and persistency, and these observations were confirmed by the fact that the grass had persisted in plots motor-mowed every week for three years. The mixture sown in the cow pasture did not include prairie grass, and it is interesting to note that in Mr. Holman's paddock of irrigation wild white clover a prairie grass of the type found at Werribee is becoming increasingly prominent. It is suggested that, if pupils of the various schools could collect a small quantity of seed of this strain, it would be a valuable addition to their collections.

Phalaris tuberosa has been of great interest to farmers of recent years, but it has a disadvantage in that it cannot establish satisfactorily in a mixture containing a good proportion of rye-grass. The rye-grass root system develops more rapidly, and crowds out that of *Phalaris*. Should the schools' competition be continued, it is suggested that it would be of great educational value to young farmers to set aside two boxes for a demonstration of points such as these.

Suggested tests are—

(1) Comparison of commercial prairie grass with old-pasture prairie grass.

(2) Demonstration of the incompatibility of *Phalaris tuberosa* and rye-grass. This was shown very strikingly at Burnley by planting out seedlings in patterns which gave different ratios of the two grasses. The following diagrams illustrate suitable arrangements:—

Diagram 1. 1 : 1 *Phalaris—Rye-grass.*

X O X O X O X O
O X O X O X O X
X O X O X O X O

Diagram 2. 8 : 1 *Phalaris—Rye-grass.*

X X X X X X
X O X X O X
X X X X X X

NOTE.—X = Plant of Phalaris tuberosa.
O = Plant of perennial rye-grass.

The seedlings can be grown in small boxes and pricked out for planting, those which do not take to be replaced for about two months.

After several years of cultivation of boxes of the various species now used, the pupils should be able to push on to simple experiments of this kind to maintain their interest. Innumerable tests suggest themselves, and the information required is available at any time from the Department of Agriculture. It can be established firmly in the minds of the young farmers through the medium of the school plots.

TABLE II.—SCHOOL PLOTS—ROCHESTER DISTRICT.

Schools.	Labelling.		General Appearance.		Variety.		Purity.		Condition.		Totals		Grand Total.
	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	Spring.	Autumn.	
Nanneella West	10	10	9½	9½	9½	9	10	10	10	9	49	47½	96½
Nanneella Estate	9½	9½	9½	9½	9½	9½	10	9½	8	9	46½	47	93½
Ballendella ..	9	8½	9½	9½	9½	9	7	8	9½	8½	44½	43½	88
Strathallan ..	8	7	8	7	9	9	9½	9	8	5	42½	37	79½

Butter Production and Export

The following table shows :—

(*a*) Factory production of butter and cheese in Victoria for the period July, 1936, to March, 1937, compared with the corresponding period of 1935–36 ; and

(*b*) Quantities and percentages of various grades of bulk butter examined for export in Victoria from 1st July, 1936, to 1st May, 1937, in comparison with the corresponding period of 1935–36.

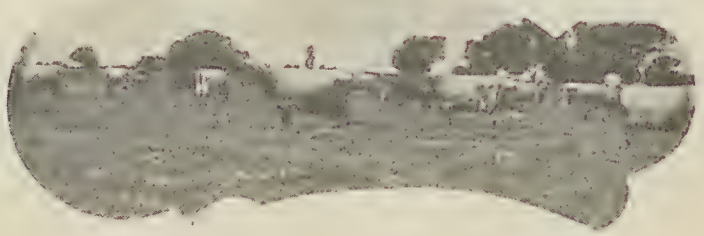
FACTORY PRODUCTION OF BUTTER AND CHEESE IN VICTORIA (QUANTITIES IN TONS).

Month.	Butter.		Cheese.	
	1936–37.	1935–36.	1936–37.	1935–36.
July to November	30,490	33,008	2,705	2,526
December	8,847*	8,476	713	579
January	7,878†	6,670	632	483
February	5,890†	4,613	466†	334
March	5,090†	3,589	423†	263
Totals, 9 months	58,195	56,356	4,939	4,185

* Revised. † Subject to revision.

BULK BUTTER EXAMINED FOR EXPORT IN VICTORIA (QUANTITIES IN TONS).

Period.	1936–37.					Period—	1935–36.				
	How Graded—				Total.		How Graded—				Total.
	Ch.	1st.	2nd.	Pty.			Ch.	1st.	2nd.	Pty.	
1st July to 27th March ..	25,777	8,624	2,407	391	37,199	1st July to 28th March ..	22,176	11,469	2,707	398	36,750
28th March to 1st May	1,198	468	187	39	1,892	29th March to 2nd May	92	154	88	21	355
Totals 1st July to 1st May ..	26,975	9,092	2,594	430	39,091	Totals 1st July to 2nd May ..	22,268	11,623	2,795	419	37,105
Percentages ..	69·0	23·3	6·6	1·1	..	Percentages ..	60·0	31·4	7·5	1·1	..



Re-working, Grafting and Budding of Deciduous Fruit Trees

By J. M. Ward, Superintendent of Horticulture, and E. E. Pescott, F.L.S., Senior Horticultural Instructor

IN practically every fruit district in Australia, certain fruit trees have been planted which, at a later date, have been found unsuitable for that district; and in some cases a variety has been grown, for the produce of which there is little or no demand.

This has been much in evidence with certain varieties of peaches planted for canning purposes in the irrigated areas of Victoria and New South Wales.

Again, in the planting of many of the early apple orchards in Victoria and Tasmania, the then best known English varieties were planted for the British markets; but, at the present time, owing to the knowledge won by experience, better keeping and shipping kinds are replacing such varieties as Ribston Pippin, Rymer, Mobb's Codling, Emperor Alexander, and others. The same thing applies to a lesser extent to pears and other fruits. There is also the question of working certain varieties amongst other kinds for pollination purposes or repairing injuries.

To grub old but healthy and productive trees and to replace them with young ones is an economic waste, for it means unnecessary hard work and loss of time. Such trees as those in question can be easily and quickly changed over to more profitable kinds, by means of grafting or budding.

As to which are the best of the different kinds of fruit trees to grow has been, and always will be, a difficult problem to solve. With the peach, one has to consider the best kinds for canning, for drying, and for the fresh fruit markets; and with the apple, there is quality, colour, storage value, freedom from disease, and other properties. Somewhat similar qualities are looked for in the

pear, plum, prune, apricot, and citrus fruits; in fact, with all our fruits. With most trees, if the grafting and budding be successfully accomplished, the newly worked buds or scions make rapid growth, for the whole of the sap from the well-established root system is concentrated upon developing these new growths.

The terms "stock," "scion," "bud-stick," "cambium layer," and "worked" will be referred to in this work, and they are thus defined—

1. *Stock.*—This is that portion of a tree—root or branch—in which a scion or bud of another variety is inserted.
2. *Scion.*—The portion of, usually, one-year-old growth, containing one or more buds which is worked on to the stock.
3. *Bud-stick.*—A shoot of the current season's growth from which buds are to be removed.
4. *Bud.*—A wood bud cut from a bud stick.
5. *Cambium Layer or Inner Bark.*—A thin layer of soft tissue situated between the bark and the wood. It is the centre of growth responsible for thickening and is exposed when the bark can easily be pealed from the tree.
6. *Worked.*—The term "worked" is usually employed when the operation of inserting the bud or scion into the stock has taken place.

The several illustrations of grafting, &c., given in the following pages are to a large extent self-explanatory, and can be followed without very much description.

There are many methods of grafting in operation in various parts of the world, but a few only of these are put into practice where fruit trees are concerned. The commonest are—The Whip or Tongue, the Cleft or Wedge, the Rind or Bark, the Strap, and the Peg or Chisel graft.

METHODS OF RE-WORKING.

There are two main methods of changing the variety of a fruit tree, namely the "crown" and the "pole."

In the "crown" method, the main arms of the tree are cut back to within a few feet of the ground during winter or early spring. On to each of the six or eight "stubs" which are left, one or more scions are grafted in spring or buds are inserted into new shoots from these stubs, according to the variety of the tree. The main advantage of this method is the rapidity with which the work can be carried out, even on very large trees. A grower, however, must be prepared to forgo his crop for a number of years, particularly in the case of apples and pears. On the whole, the "crown" method is recommended for stone fruits and citrus.

Grafts for "Crown" Methods.

The Whip or Tongue Graft.

The Whip or Tongue graft method is employed when scion and stock are of somewhat similar dimensions, or in instances where the stock is twice the thickness of the scion. It is both simple and effective. From three to five main arms containing young growth are selected when a mature tree is to be grafted over by this method, and a scion placed on each as follows:—Each limb is cut so that a long—1½ inches to 2 inches—smooth, slanting surface is obtained. This operation should be carried out by making one clean cut with a sharp knife.

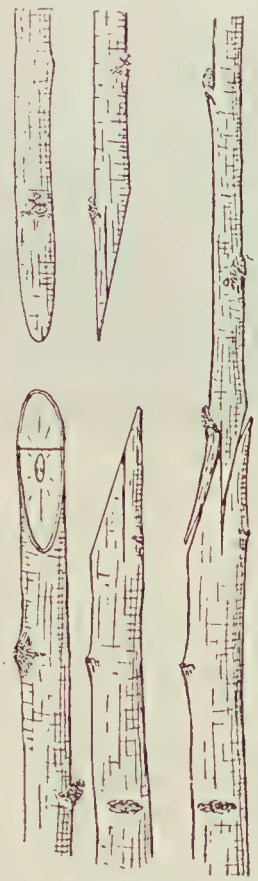


Fig. 1.—Showing both stock and scion in the whip or tongue graft.

The scion is then similarly treated and a small "tongue" made in the surface of both stock and scion (see Fig. 1). A union is made by bringing the cut surface together so that the two tongues fit into each other. Care must be taken to see that the cambium layers (inner bark) of both stock and scion come into close contact with each other, otherwise failure will result. The grafted portions are then tied tightly together with raffia or other suitable material, and the whole waxed over.

The whip or tongue graft is used for young stock in the nursery to a greater extent than any other graft. In this work, both scion and stock must be of uniform diameter, so that the resultant union will be of as even a character as possible. A "whip" is a single stemmed yearling nursery tree which has been worked by the "tongue" graft, the small slits in both stock and scion giving rise to the "tongues."

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Cleft or Wedge Graft.

The cleft or wedge graft was practised to a greater extent some years ago than it is at the present time. It is used on limbs from 1 inch and

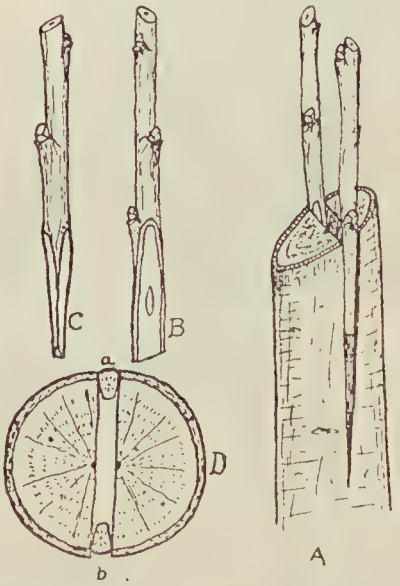


Fig. 2.—The Cleft graft.

A. Completed graft ready for waxing.
B. Side view showing bevel of scion.
C. Back view showing wedge shape bevel of scion.
D. Cross section — (a) Incorrect method of setting scion, no cambium contact; (b), scion correctly set to secure cambium contact.

upwards in diameter. The branches to be reworked are cut hard back and split across the surface of the cut, and the scion, which is cut in a wedge-like shape, is inserted in this split in a manner

Fig. 3.—A section view of the cleft graft. Note how the wood of the stock has rotted away; this is due to exposure, which has allowed the entrance of fungi.

that brings the cambium layer of the scion in close contact with the cambium layer of the stock. This graft is not recommended on account of many faults that may arise, also because there are better methods in practice.

While in a number of instances the scion grows vigorously enough to heal up the split stock, there are many more instances where the split never heals. Fungi enter this part of the stock and decay takes place, and very often a shell only of sound wood on the outside circle of the grafted limb is left.

Further, large wounds in trees form suitable entrances for shelf fungus (*Polystictus* species). This fungous attack is very prevalent in southern Victoria, and in almost any area where humid conditions prevail. Polystictus is very serious; it has been known to kill old mature trees in a period of from two to three years.

The Bark Graft (Crown Method).

The bark graft is superior, in many respects, to the wedge graft, owing to the reduced danger of rotting, as no split is made in the stock. The scions are prepared as for the wedge graft, except that only one sloping cut is made, the cut face being about 2 inches in length. The stock is cut back, as in the cleft graft, and a vertical cut about 2½ inches long is made in the bark where the graft is to be inserted. The bark is gently opened down this cut, the scion inserted until the shoulder rests on the stock, and then it is securely bound with raffia and waxed in the usual way. Several such bark grafts usually are inserted around each stock, according to the diameter.

An alternative method for preparing the stock for the insertion of the scion is to make two parallel vertical cuts, their distance apart being equal to the diameter of the scion. A strip of bark is then bent back as shown in Fig. 6A (this illustration refers to the strap graft however, which is a modification of the bark graft).

Fig. 4—The bark graft.

The Strap Graft.

For trees with limbs from 1 to 6 inches in diameter the strap graft is usually found to

Fig. 5.—The strap graft.

(a) The scion ready for preparation; (b) the prepared scion, showing small portions of bark removed from the back part of the "strap"; and (c) showing piece of bark removed to complete "wedge" portion of scion.

The wood from which the cut has been made is then removed by making a slanting cut about 1½ inches long on the opposite side from that where the "strap" was cut. The length of the "strap" should be the diameter of the stock, plus about 1½ inches. The scion is then ready for insertion into the stock, which is prepared in the same manner as explained in the bark graft, with the addition that the bark is also cut and eased away from the opposite side of the stock from where the scion is placed, so as to allow the insertion of a portion of the "strap" into the stock (see Fig. 6). The whole is then securely tied and waxed, including the flat surface of the stock.

It is essential to carefully tie the "strap" hard down on to the surface of the cut. It will be found that the "strap" will quickly grow and cover over the cut. Although the explaining of the strap graft takes some little time, the operation itself is quickly performed, and after a little practice any grower can quickly become an expert strap grafter.

Fig. 6.—(a) The scion of the strap graft inserted and ready for tying; (b) after tying and before waxing.

be a suitable method, provided that the trees are in vigorous growth, and that there is no danger of a Polystictus entry. The graft is so named from the "strap" which crosses over the cut surface of the limb. The scion is cut in such a manner that a strip of bark, together with a little wood attached, is partly removed. This forms the "strap" as shown in Fig. 5.

The strap graft has several advantages over many other grafts for the "top-working" or "re-working" of established trees; one of the chief points is the rapid covering up of the cut surface of the stock, thus preventing the latter's decay.

Some years ago the strap graft was used rather extensively for re-working established apple trees in the Gippsland districts, particularly in the Pakenham areas, and to-day fairly old and large

Fig. 7.—Cross section and exterior from a successfully strap-grafted tree. Note complete protection of the stock by the growth of the scion. No opportunity for Polystictus infection.

strap-grafted re-worked trees can be seen in these districts, the work having been done in a skilled manner with successful results. In the Doncaster and surrounding districts, the cleft graft was practised formerly with some success, but at that time the polystictus fungus was not serious. To-day very few growers are resorting to the cleft, strap or any other "crown" method of re-working apple trees, the "pole" methods being favoured throughout the State, when sufficient time is available.

Fig. 8.—Strap grafts—two-year-old scions. The "strap" will quickly cover the whole of the cut surface.

"Pole" Methods of Re-working.

The term "pole" in this article refers to methods of re-working in which the main frame work of the tree is not materially reduced in size or height. This necessitates a very large number of grafts or buds (according to the particular method adopted), being inserted at short intervals along the whole length of the main arms or limbs, all the previously existing shoots and spurs being removed. In a big tree the number of grafts may possibly run into several hundreds.

The main advantage of this type of re-working, in comparison with the "crown" methods, is the rapidity with which a good crop is again obtained from the trees. They often bear a little fruit in the first year and in two or three years, where care is observed, may be almost back into full yield. Another important advantage is that danger from attack by the Polystictus fungus is greatly reduced since no big cuts or exposed surfaces are made in this process.

The main disadvantage in the method is the time taken to re-work a tree and the resultant greater cost. A medium sized tree would possibly cost 1s. 6d. by the "crown" and 9s. to 10s. by the "pole" method.

There are several ways in which "pole" re-working can be carried out. Firstly, all laterals of

Fig. 9.—Top left, apple tree before pollarding; top right, the same tree after pollarding; bottom left, the grafts inserted; bottom right, the same tree six months later.

the old variety are cut back to within an inch or two of the main limb and a whip tongue graft of the new and selected variety is inserted at each cut. Young, vigorous laterals only should be used. All old laterals and fruit spurs must be removed.

Secondly, the laterals may be budded instead of grafted. Buds are inserted into the base of the young and vigorous laterals, the old ones being removed as before. Spring budding is to be preferred, although the work may be continued well into December.

In addition, these old laterals, and in fact all growth, may be entirely removed flush with the main limbs. The tree in this state is said to be pollarded. These limbs are then worked over with "peg" or bark grafts.

When the trees are being re-worked by budding or bark or "peg" grafting, it will be necessary to work either a small strap graft or a whip-tongue graft on to the tip of the leader.

In the re-working of apricots, peaches, almonds, oranges, lemons, and other citrus fruits, the trees are cut down to within 6 to 12 inches of where the main arms fork out from the trunk of the tree, and buds are inserted into the new growth that results from the cutting down process.

Grafting of these varieties of fruit trees is not so successful as budding.

Plum trees—like the apple and pear—can readily be budded or grafted. When obtaining buds or scions, the operator should secure them from trees producing the very best type of fruit. The health and productivity of the tree should also be taken into consideration.

The "Peg" Graft.

This graft has been variously called "peg," "plug," "porcupine," or "chisel" graft, on account of the short character of the scion, the plug method of insertion, and the use of the chisel.

The scion should be short, about 3 to 4 inches in length, cut to wedge-shape at the base, on a short bevel about half

an inch in length. *A bud should be left* just at the beginning of the wedge cut, on one side, as shown in the sketch.

Tools.

Two chisels will be necessary, so that openings may be made to suit the size of the graft; those $\frac{3}{8}$ and $\frac{1}{4}$ inch in width are of the right gauge. The bevel of the chisel is too short for grafting work, and before using it should be ground down on a stone to double the ordinary length of the bevel. This long narrow bevel makes a suitable wound which does not unduly split the wood or the bark. A wooden mallet also is required; any home-made one will do; a piece of 3-in. x 2-in. hard-wood, cut down at the handle end, is the tool most frequently in use. Home-made brushes may also be used; the simplest consists of three or four pieces of binder twine, unplaited, and tied to a short stick. Another may be made of short lengths of horsehair tied to a stick or hammered into a piece of tin. A small brush will be quite satisfactory and will be more economical of sealing material.

Method.

For complete "peg" or "bark" grafting, the whole tree should be denuded of its laterals just before the operation of re-working. All laterals should be cut completely away, and the top of the leader cut right at the top; the cut must be as high up as possible, so that it will have quite a

Fig. 10.—"Peg" grafts, 3 weeks after insertion. Re-sealing is now necessary.

Fig. 11.—"Peg" graft, one year old, after pruning.

small diameter, on which an ordinary whip-tongue graft can be placed.

Incisions are made with a chisel right into the wood of the leaders, at right angles to the growth, and at a downward angle. The incision should be about three-quarters of an inch in length. It may be made with the chisel; the mallet should be used gently.

It is advisable to make all the incisions before driving in any of the scions, as vibration will cause the scions to jerk out. Incisions should not be made any closer than nine inches; even a foot apart will frequently be sufficient for the grafts. All incisions must be made on the upper side of the limbs.

The "pegs" should all be prepared before insertion; there is no objection to cutting them overnight, provided they are kept covered with a moist bag. They should be kept quite free from dust or dirt of any kind.

Sealing.

When the limb or the tree has been worked-over with the chisel cuts, the scions should be driven home with the mallet. Several points here are urgent. The "peg" must be driven right home, so that the whole of the "cut" portion is inserted into the wood and the bark. No white must be showing. The bud near the base of the "peg" should be just seen below the bark. The "peg" should be driven firmly into the cut.

Then the whole of the scions should be "sealed" or rendered air-tight by being painted over at once with the selected sealing material. The painting must not be carelessly done; every portion of the wound must be covered. Some

Fig. 12.—"Peg" grafts inserted in September and photographed the following April.

growers give a little touch of the "sealer" on to the top of each scion. But on our present experience this does not appear to be necessary.

A very important point is that a re-sealing operation usually is required. A fortnight after the work has been completed, the wounds should be again painted wherever any cracks or openings are seen.

Two other matters require attention. The grafts must be kept growing by irrigation or by cultivation to prevent soil drying. Most cases of failure investigated show that dry weather and dry soil checked the development of the grafts. The second point is that regular watch must be kept to see that there is no re-growth of the old variety; if there were and it were permitted to remain it might become dominant.

When modern methods of re-working trees were first introduced, buds or whip-tongue grafts were placed on the existing laterals. Buds were inserted at the base of all suitable laterals, preferably in spring. Old laterals and spurs were cut right away and as new growths came, and were suitable for working, buds were inserted into these. One illustration shows fruit in autumn, from spring inserted buds. (Fig. 12.)

The same principle was followed in using the whip-tongue graft; these grafts were inserted in early spring wherever suitable laterals were placed, and later, on new laterals.

Then, thirdly, the whole tree would be cleaned out as for "peg" grafting, and buds or whip-tongue grafts inserted as occasion arose.

Some trees have been re-worked by inserting both whip-tongue grafts and buds, as opportunity occurred.

The Bark Graft (Pole Method).

This operation is carried out by placing the cut face of the scion in contact with the cambium, just under the bark.

The scion is prepared by slicing one side only of the piece of wood. The cut face is usually an inch or more in length; but there are variations of this method whereby the cut face of the scion is often two or three inches long. Sometimes a slit or small slice is made on the bark face; usually, with short or long cut scions, a small section is cut from the side of the wood so as to allow for better contact with the cambium. The basal bud here is again urgent.

It is important that the bark should "run" very freely; therefore the operation of bark-grafting cannot be performed until the sap is flowing in spring. Usually the best time for the work is from September to November.

There are various types of bark openings. The bark may be opened in the usual budding way by the "T" cut. This may be varied by inversion; or the cut may be made "L" or "V" shape; or by inverting either of these. A mere slit often serves while sometimes a small square is cut from the bark. In any of these cases the bark may be lifted, or it may be left

Fig. 13.—Long bark grafts showing fruit spurs formed.

untouched. In the latter case, the scion is gently forced between the bark and the cambium.

As with the "peg" graft, the whole of the cut portion of the scion should be hidden under the bark.

Strong sturdy scions are not always necessary in the bark graft method. If a piece of "terminal" wood is used, that is, the end of the lateral or scion which usually carries the fruit bud, this scion frequently will bear fruit in the coming autumn.

If the bark has been opened for the scion insertion, the scion is usually fixed in place by a small tack. Tacks of almost any make may be used, but the most convenient and the cheapest is the small one known as the bootmaker's "tingle." In the re-working of the Keiffer pear archway at the nursery of Mr. F. Walker, Tasmania (Fig. 14), 28 lb. of such tacks was used, for between 20,000 and 30,000 grafts.

A greater degree of success has been attained by inserting the grafts into the bark through the agency of an opened slit. The slit is made by opening the bark with a packing needle which has had the sharp point cut off, the end forming a flat, sharpened chisel. This is forced into the bark, lifting it from the cambium for a length of about 2 inches. The prepared bark graft is then gently forced into the aperture so made, until it is firmly in position. This operation may be done at any time from September to December provided that the bark will "run" satisfactorily.

Fig. 14.—Keiffer pear pergola in orchard of Mr. F. Walker, Tasmania. Left side, re-worked; right side, work proceeding. (25,000 side grafts were used in the work.)

Fig. 15.—Bark grafts, one season's growth. Photographed August.

It is of great importance that the trees shall be both healthy and vigorous in growth. Trees in bad condition and not growing well, and those already attacked by Polystictus must not be re-worked, as they will not respond to the work. Such trees should be removed from the orchard area, and new ones planted in their place.

In re-working, age appears to be no limit to the work. Many trees of 30 and 40 years old have been re-worked successfully. In the orchard of Mr. James Lang, Harcourt, an 80-year-old apple tree was re-worked with over 1,000 scions and the tree is now fruiting freely.

Storage of Scions.

Wood for scions should be cut from the tree when it is dormant, preferably in July. The scions may be "heeled in," in the usual way, by placing them in the ground in a horizontal position and covering the ends with soil. They may also be kept in the cool store chambers; where in a few inches of damp sand or in moist paper they may be stood in petrol tins or boxes.

If the work is to be done late in the season, or if the scions are required for late bark-grafting, it is almost essential that they be kept in cool store, or at any rate in a very cool chamber or cellar.

BUDDING.

Shield budding is the main method employed when budding fruit trees. There are a few variations, but the fruit-grower is usually concerned with the one in general practice. This is shown in Figures 16 and 17. Some operators prefer the

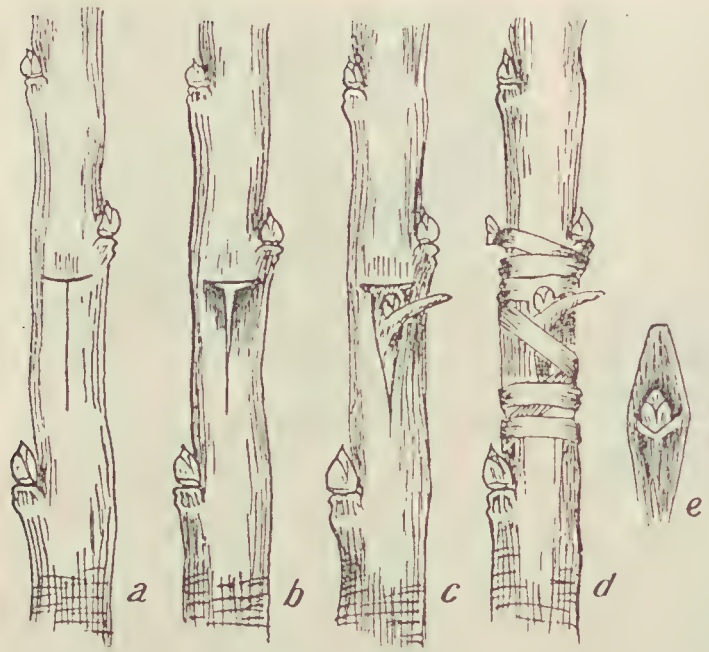


Fig. 16.—Budding.

(a) T-shaped cut in stock; (b) the bark raised ready to receive the bud; (c) the bud inserted and ready for tying; (d) the operation completed; and (e) a well developed bud.

inverted T because it is often more convenient for the budder. It is coming more into general practice, both in nursery and in general work.

Budding is performed on deciduous trees during the months of November, December, and February, when the sap is running freely, and buds are inserted on the current year's growth. With citrus trees, budding is done both during the autumn (March and April) and the spring (September and October).

The operation is a simple one, and with plenty of practice can be quickly performed. Only well-developed buds obtained from trees producing good quality fruit should be used. Care should be taken in removing the bud from the "bud-stick"; it should not be cut too deeply; the small portion of the wood that is cut with the bud should be removed from apricot, peach, and cherry buds, but with apples, pears, plums, and citrus trees a thin portion may be allowed to remain with the bud. When removing the wood from any bud great care must be exercised in seeing that the small eye of the bud is not removed, otherwise the bud will not "take." The stalk of the leaf is left on the bud; this acts as a handle when inserting the bud into its place.

The bud is inserted just under the bark (next to the cambium layer) in a T-shape cut made in the stock, and is then securely tied with raffia or string. The bud is left in this condition until a good union results. The tie is then cut or loosened. The bud from a deciduous tree, or from the autumn-budded citrus, remains dormant until the following spring. The citrus buds inserted in the spring will make growth the following summer. During the winter or spring months, the old wood is cut off just above the newly inserted bud and the new growth from the inserted bud becomes the future tree or main arm of the tree, as the case may be.

If budding over old trees is desired, it is usual to cut the tree down during the dormant season; the buds are then inserted into the new spring growth that follows the hard cutting back; this is especially the case with citrus fruit trees.

Stone fruit trees should be budded during November, December, or February; the sap is usually running more freely in such trees during those months. The budding of apples and pears can take place during November and February, and in some seasons as late as March, but Novem-

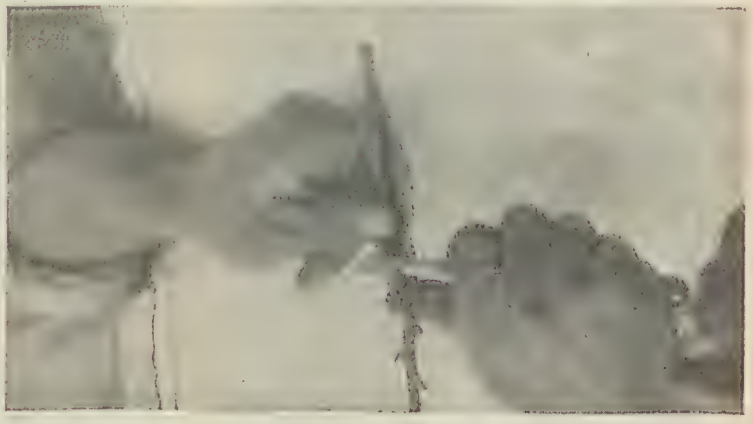


Fig. 17.—Removing a bud from a bud-stick—as it appears to the budder.

ber and February are the usual months for budding pome fruits.

To obtain successful results in budding, the following points should be observed:—

1. Use a very sharp knife; (2) use only well-matured buds; (3) bud when the sap is running well; (4) do not allow the sap on either bud or stock to become dry or brown; (5) the tie should receive attention a few weeks after budding takes place; (6) six weeks or so after the bud commences to grow, the new growth may require attention by way of staking or pinching back to prevent damage by wind. Do not hesitate to give the required attention.

A tree, either an old or a young one, may be prepared for the budding operation first by removing any of the surplus stems or foliage that would interfere with the bud after its insertion, by brushing or rubbing. To ensure that there shall be good sap movement to allow an easy lifting of the bark, if necessary and practical, the trees should be given a good watering a day or two before the operation is to be performed.

(For a fuller description of budding see pamphlet on Budding of Citrus Trees issued free by the Department of Agriculture).

Grafting Waxes and Sealing Materials.

There are several preparations in use as grafting wax. The oldest is a mixture, prepared by heating equal parts by weight, of resin, tallow, and beeswax. Another preparation has the quantity of beeswax reduced to a ¾ part. Another is, 1 part resin, 1 part beeswax, ½ part tallow, and ½ part lard. This wax can be used hot or cold.

If waxed calico is preferred, 6-inch strips of cheap calico can be dipped into the hot wax, and when thoroughly soaked, the strips should be immediately drawn through two pieces of wood, so as to remove the surplus wax. The waxed calico can, when cold, be torn into strips of the desired width.

The preparation that has proved most successful in Victoria is the Colas and starch mixture. A tablespoonful of ordinary powdered starch is added to one and a half pints of Colas. The mixture should be stirred until the starch has "cooked." If the mixture is too thin, add more starch; if too thick, add more Colas. The formula is not important as to quantities; what is required is a mixture that may be easily painted on to the wound, and that will not dry too quickly. Starch has been found to give the correct body to the Colas.

There are several commercial preparations on the market which are quite good. Petroleum jelly is largely used in Tasmania; it has a tendency to run too freely in hot weather, with the result that air may be allowed to enter the wound. Pitch or Stockholm tar causes too coarse and large a callus; both are objectionable in that they remain too long on the bark.

It is very important, whatever preparation be used for the sealing operation, that it shall not be so thin that it will "run" or work its way into the graft opening. In many cases, such thin sealing material has penetrated into the wound, thus preventing a union between stock and scion.

Inarching and Bridge Grafting.

"Inarching" and "Bridge" grafting have, for many years past, been largely practised in Canada and the United States of America, but have not been in vogue in Australia to any extent.

Fig. 18.—This tree had a weak rooting system. A seedling stock was placed at the foot of the tree and grafted on to the foot of the trunk. The new stock grew rapidly and soon put new vigour into the tree.

These grafts are used chiefly to "repair" trees that have been damaged, or in the case of a tree whose root system is weak or has been injured.

The method is simple, yet very effective. The accompanying figures explain the system of "inarching" and "bridge" grafting fairly well. Both these methods of grafting could, with benefit to fruit-growers, be used to a considerable extent in many orchards throughout Australia. The system may be used to improve the vigour of a weak tree. Weakly growing apple trees may be so treated with successful results. One or more apple seedlings should be planted at the foot of each weak growing tree (which may be due to a poor root system) and grafted on to the tree trunk. The tree is then given renewed vigour.

Bridge grafting is usually put into effect in instances where trees have been injured by hares or rabbits eating away the bark, or by cultivating implements, and where trees have been affected by disease. The damaged portion (provided any disease present has been eradicated and the wound cleansed) can be healed-up by bridge grafting.

Fig. 19.—Bridge grafting on an injured trunk of a pear tree. Scions in place ready for tying and waxing over.

Fig. 20.—Inarching young stock planted at foot of an injured trunk and grafted on to the tree, and ready for tying and waxing.

Fig. 21.—Trunk of an injured orange tree which has been "bridge-grafted."

In preparing the parts that are to be "bridged," it is essential that they should be thoroughly cleansed and dead or diseased bark cut away. The scions should be a little longer than the part that is to be "bridged."

The scion is prepared by bevelling both ends in a somewhat similar manner to that described for the "bark" graft, except that the sloping cuts are usually longer and possibly a little thinner than those on the scions used in the bark graft; the thin wedged ends allow the scion to be thrust under the bark of the trunk fairly easily and without damage to the cambium layer. A cut is made in the bark of the stock—tree—similar to that seen in Fig. 19.

The scions, as in all grafting, are securely tied and waxed over.

Unusual Methods of Budding.

A number of adaptations or variations of the usual budding methods are practised where ordinary methods are difficult, or where the bud will not "take" under ordinary circumstances.

[*Continued on page 312.*

"Leak" or "Watery Wound Rot" of Potatoes

By S. Fish M.Agr.Sc., Biologist, A. T. Pugsley B.Agr.Sc. and J. P. Ryland B.Agr.Sc. Assistant Plant Pathologists.

FOR some years potato growers at Dalmore and Koo-wee-rup have experienced severe losses in the marketing of their potatoes. Although consignments may show no visibly-affected tubers on inspection at the loading stations, such consignments may develop a watery tuber rot during or after transport. Bags containing potatoes in an advanced stage of the disease are frequently wet in patches where rotten tubers have been crushed against the side. This trouble is particularly evident in those potatoes dug and marketed during the hot days of January, February, and March.

The occurrence of this disease in consignments has had the effect of shattering the confidence of buyers in certain lines of potatoes. This has led not only to the limiting of the distribution of potatoes coming from this area, but also has had the effect of depressing the market value of such potatoes, even of consignments which arrive in a sound condition, while slightly-affected consignments may return about one-third or less of the ruling market price. While some local opinion suggested that this trouble was more severe where potatoes were manured with sulphate of ammonia, no evidence has been obtained to support such a view.

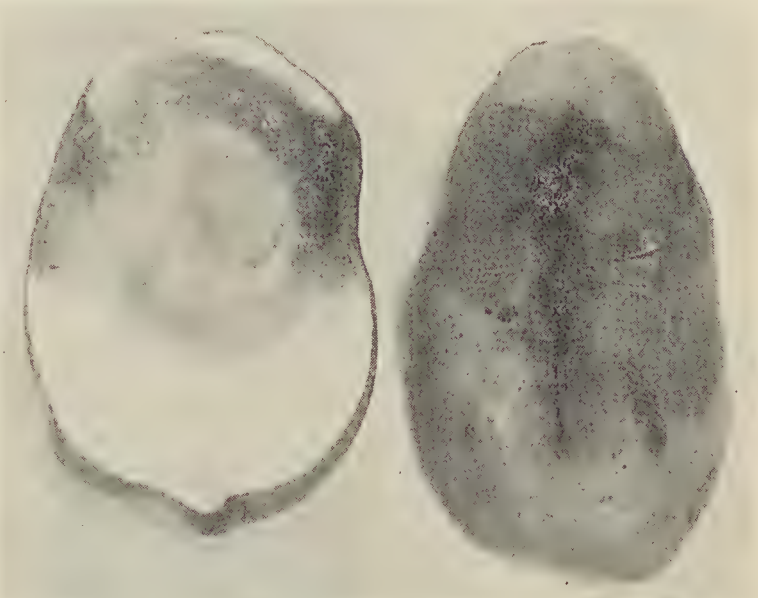


Fig. 1.—"Watery Wound Rot"—Natural infection at a fork mark.

An investigation recently conducted by the Department of Agriculture has demonstrated beyond doubt that the trouble is caused by a parasitic soil-inhabiting fungus, *Pythium de Baryanum* Hesse. This fungus, well known as the cause of "damping-off" of seedlings, has been recorded in other parts of the world as causing a transport trouble in all respects similar to that found in this State.

Hawkins (1) described the disease under the name of "Leak," and stated that it occurred in the peat soils of the delta region of the San Josquin River, California, U.S.A. Pethybridge and Smith (2) describe it as "a watery wound rot of the potato tuber," and reported it as causing serious damage in England in 1929, while Dowson (3) noted its presence in Tasmania in 1931, and referred to it as "fork stab rot of the early potatoes."

Symptoms.

The symptoms of "watery wound rot" as they occur in a typical case are illustrated in Figure 1. The progress of the internal decay

in the tuber is usually indicated by the outward appearance of the skin. The rotted portions are of a darker brown colour and rather soft to the touch. The skin separates from the flesh of the tuber so that it can be readily peeled off, and, when broken, a considerable quantity of brown, watery liquid exudes and the potato "leaks" or "melts." The rotted tissue is quite pulpy and of a dirty white colour except at the edges, where exposure to the air causes it to darken to a grey or brown and finally a black.

The rotting of a tuber is always associated with some injury such as a wound made by the prong of a digging fork or the breaking of the skin of an immature potato. The fungus seems to be incapable of attacking the undamaged skin of the tuber.

Another characteristic feature of "watery wound rot" is the rapidity with which the decay progresses. Under favorable conditions a tuber may be completely rotten within a day or two.

The rapid development of a soft rot associated with an injury to the skin, and the presence of a clean, brownish liquid, are the more important features by which one can recognize the disease.

The Source of Infection.

As already stated, the cause of this disease is the parasitic fungus, *Pythium de Baryanum* Hesse. This fungus has been isolated from typically diseased tubers, and, when inoculated into sound potatoes, readily reproduced the disease. (Fig. 2.)

Under natural field conditions soil may become contaminated with this fungus, so that if a tuber is wounded during digging operations, and soil harbouring the fungus gains entrance into the wound, the tuber develops "watery wound rot."

From a survey of certain farms in the Dalmore and Koo-wee-rup districts where this disease occurs, it was found that little or no trouble was experienced by those farmers who adopted a long rotational practice, but on land where potatoes had been growing continuously, or in a very short rotation, the incidence of the disease was much greater.

On a farm one crop of Carman potatoes was grown on land part of which had been six years in rye-grass and clover, and part in potatoes three years out of the past four. The consignments from the long-rotation section were arriving in a sound condition, whereas those from the ground which had grown potatoes three years out of four were arriving in the market in a faulty state, so much so that the grower ceased marketing that section. Soil taken from both sections and inoculated into sound potatoes showed that no infection occurred in the potatoes inoculated with soil from the long-rotation section, whereas an 80 per cent. infection resulted from the inoculations with the soil from the other section.

Having noted that the disease is contracted from a parasitic fungus in the soil, one can readily understand that the return of rotten tubers to the soil is a sure way of maintaining and even increasing its incidence there. The importance of gathering up and destroying all diseased tubers after lifting the crop, therefore, cannot be too strongly stressed.

Fig. 2.—A potato 24 hours after inoculation with the parasitic fungus ("Watery Wound Rot").

Avoid Mechanical Injury to Tubers.

Local evidence is in agreement with overseas work, which has shown that the fungus is unable to penetrate an unbroken skin, and that a wound is necessary before the parasite can gain entrance to the tuber. It follows then that all possible care should be taken to avoid mechanical injury to the tubers during lifting and handling operations.

Although the exclusion of damaged potatoes will considerably reduce the percentage infection, in practice it is not always possible to entirely prevent the appearance of the disease in this way. Two lots of potatoes were examined from a crop on soil which had grown three crops of potatoes in four years. In lot 1 the usual precautions only were taken, to exclude tubers showing mechanical injury, whereas in lot 2 special care was taken to exclude tubers showing visible injuries. After they had been left in a shed for a period of some days, an examination revealed 17 per cent. infection in lot 1 as against 6 per cent. in lot 2. From this it is shown that, where the ground is heavily contaminated with the fungus, it will not be possible to prevent the trouble from developing entirely, even by taking special precautions in the selection of only sound tubers. It is the presence of infection in a consignment rather than the percentage which affects market value.

Relation of Temperature.

Hawkins (1) has shown that the optimum temperature for the growth of the fungus *Pythium de Baryanum* is high (between 86 deg. and 95 deg. F.), and that it infects potatoes more readily at temperatures near this optimum. This is in agreement with the well-known fact that the disease is much more common and severe in hot weather. Local experience has shown that, when digging is done during warm weather, those farmers who dig only "short" runs of potatoes and then "pick up" have less trouble with their consignments than where the potatoes are permitted to remain on the ground in the heat for long periods.

Recommendations for Control.

The following measures are recommended to growers for the control of "watery wound rot" of potatoes:—

1. The adoption of a long rotation. Potatoes should not be grown on the same land more often than one year in three, and preferably one year in four. Intervening crops may be pasture, oats, onions, maize, peas.

2. After digging, care should be taken to gather and destroy all diseased tubers, in order to prevent an accumulation of the causal fungus in the soil.

3. Care should be taken to prevent injury while digging the crop.

4. Sound tubers only should be bagged.

5. The temperature of the potatoes should be kept as low as possible by digging only during the cooler periods of the day, or, alternatively, by digging "short" runs before bagging.

6. Loading hooks should not be used on potatoes coming from areas where this disease is prevalent, as they serve as a means by which sound potatoes are infected from the soil adhering to the potatoes.

References.

(1) Hawkins, L. A., 1916.—"The disease of potatoes known as 'Leak.'" *Jour. Agric. Res.* 6, p. 627.

(2) Pethybridge, G. H., and Smith, A., 1930.—"A Watery Wound Rot of the Potato Tuber." *Jour. Min. Agric.* 37, p. 335.

(3) Dowson, W. J., 1931.—"Fork stab rot of early potatoes." *Tas. Jour. of Agric.* 2, p. 26.

The Leaf-Eating Ladybird

(*Epilachna vigintioctopunctata* Fab.)

By R. T. M. Pescott, M.Agr.Sc., Entomologist.

LADYBIRDS are usually considered by agriculturists and horticulturists as being friendly or beneficial insects. This is the case with the majority of the ladybirds, many species being parasites and predators of such destructive insects as aphides and scales. For example, the well-known Australian ladybird (*Rodolia cardinalis*) was introduced into California from Australia some 40 years ago to control the cottony cushion scale in citrus.

Fig. 1.—Potato Crop at Genoa completely defoliated by the leaf-eating ladybird.

However, there is one group in the large family of ladybirds which contains members which are plant feeders, and are destructive to economic crops. It is to this group that the leaf-eating ladybird (*Epilachna vigintioctopunctata* Fab.) belongs. This ladybird is here recorded from Victoria for the first time. In 1935 it was reported to the writer from the Genoa district, in the extreme eastern section of Gippsland. It was, on that occasion, seriously damaging the foliage of potato plants, in some cases completely stripping the plants of leaves, and leaving only the bare stalks (see Fig. 1). An inspection of this area has shown that the ladybird is apparently restricted in its activities to the Parishes of Maramingo and Wangarabell.

Host Plants and Economic Importance.

In Victoria, this insect appears to be restricted in its feeding to plants belonging to the family Solanaceae. Thus among crops of economic value it is to be found chiefly on potatoes, while tomatoes are occasionally damaged. Several species of noxious weeds of the same family act as host plants also for this insect, and it is largely on account of the extreme difficulty of attempting the eradication of these weeds from a district that it has not been found possible to completely eradicate the pest from Victoria. Such weeds as thorn apple (*Datura stromonium*), frequently mis-called castor oil plant, black nightshade (*Solanum nigrum*), and apple of Peru (*Nicandra physalioides*) act as host plants for the insect in Victoria.

In New South Wales and Queensland, this insect is frequently found on melons, pumpkins, and other such plants, and also on cotton. This has not yet been observed in Victoria, even although such plants have been common in the area of infestation. From overseas, the species is also recorded from tobacco and the egg plant.

With this leaf-eating ladybird, both the larvae and the adults are active feeders, the larvae being most commonly found, but not always, on the under surface of the foliage. The adults, however, do not appear to have any special preference, being found feeding both on the upper and under surfaces. Irregular patches are eaten out of the leaf, leaving a thin network of tissue on the opposite side (see Fig. 2). A badly-damaged leaf has a lace-like appearance, the tissue of the leaf being eaten

Fig. 2.—Potato leaf showing typical damage caused by larvae. Note larva on leaf.

away in patches. A few of the insects (either larvae or adults) feeding on the foliage usually only retard the growth of the plant, but, when present in large numbers, defoliation may take place, resulting in the death of the plant.

Distribution.

In Australia, this species has been previously recorded from the warmer areas only, extending from New South Wales into Queensland and the Northern Territory. It is now in addition recorded from East Gippsland, in Victoria.

Overseas, it is to be found in India, Ceylon, New Guinea, Fiji, the Malay Archipelago, Japan, China, and the Philippine Islands.

Life History.

As far as can be ascertained in Victoria from field observations, overwintering occurs in the form of the adult beetle, either sheltering at the base of low-growing shrubs, under the loose bark of eucalypts and acacias, or around those weed host plants as can survive the winter conditions. With the commencement of spring, and the growing of early potato crops, the first eggs are laid on the foliage of such plants. There are two complete generations of these ladybirds in Victoria.

There are four stages present in the complete life history of this insect—(*a*) the egg, (*b*) the larva, (*c*) the pupa, and (*d*) the adult.

The Egg.—The eggs of this insect are elongated in shape, yellow in colour, and measure about one-twelfth to one-sixteenth of an inch in length. They are laid during the day in clusters of from 6 to 50 eggs, on the under surface of the foliage (see Fig. 3). In roughly four days these eggs hatch, the young larvae pushing their way through the end of the egg.

Larva.—The larva or grub is very pale-yellowish in colour, measuring up to $\frac{3}{8}$ inch in length when fully grown. The surface of the body is covered from the head end to the hind end with a number of stiff, branched spines (see Fig. 4), which are greyish in colour, with rather dark tips. A period of, roughly, four to six weeks is required for the larvae to become fully grown.

When fully grown, and immediately prior to pupation, the larvae show a tendency to gather together at the base of the host plant, and there pupate (see Fig. 5). In other countries it has been observed that pupation frequently occurs on the under surface of the leaves. This has proved to be the exception in Victoria, although, in isolated cases, pupation has been observed to occur on the foliage of maize plants adjoining a potato field. In no case was any injury apparent to the maize plant.

Fig. 3—Egg cluster on under surface of foliage.
[*Queens. Agric. Journal.*]

In one instance, pupation was observed to occur on the surface of a small potato protruding through the ground (see Fig. 6). Particularly in areas where flat cultivation of the potato crop is practised, this constitutes a possible means of distribution of the pest from one district to another.

Pupa.—The pupa (see Fig. 5) is oval in shape, and measures about $\frac{1}{4}$ inch long and slightly less in width. It is usually attached firmly at its hind end to the base of the plant and at

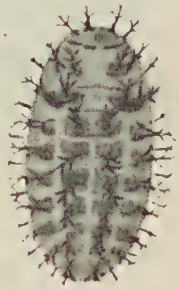


Fig. 4.—Larva of leaf-eating ladybird.
[*Queens. Agric. Jnl.*]

Fig. 5.—Cluster of pupae at base of potato plant.

soil level. The body is creamy coloured, with dark-brown transverse markings. The pupal period occupies about seven to ten days. At the end of this time the pupal skin splits and the adult insect emerges.

Adult or Beetle.—A freshly-emerged adult is pale-yellow in colour, and entirely without markings. Within an hour or two it becomes bright-yellow to orange, and a number of spots become apparent on the back. These become more pronounced until, finally, usually 28 dark spots are very evident (see Fig. 7). The beetle is oval in shape; having the tip of the abdomen more or less pointed. In length the beetle measures ¼ inch, and is approximately the same in width.

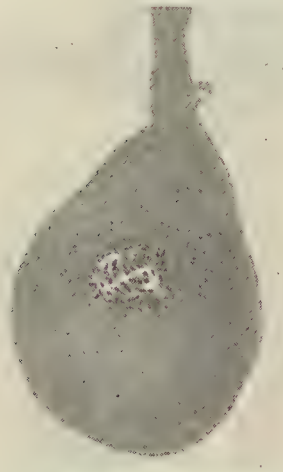


Fig. 6.—Pupa attached to young potato tuber.

The adults have rather a poor flight, flying only short distances in the warm sun. They appear to become perfectly dormant during dull or cold weather. Each female beetle may lay from 100 to 250 eggs, the egg laying being extended over a period of many weeks.

Control Measures.

Control measures, to be reasonably successful, must be applied early in the season, at the first signs of young larvae on the plant, or as soon as the first damage is apparent on the foliage.

As the result of field dusting work conducted in the Genoa district, it has been shown that successful results can be obtained by dusting the affected plants with a combined arsenate of lead and nicotine dust, containing 25 per cent. of arsenate of lead and 2 per cent. of nicotine. With this dust, the nicotine element was shown to be a valuable contact insecticide against the young larvae, while the arsenate of lead was effective as a stomach poison against the more mature larvae and the adult beetle.

Fig. 7.—Adult ladybird.
[*N.S.W. Agric. Gaz.*]

Owing to the rapid growth of the young potato plant, it may be necessary to repeat the application of the dust so as to enable a thorough covering of the plant to be obtained.

References.

Temperley, M. E.—"The Leaf-eating Ladybird." Queens. Agric. Journal, xxx., 1, p. 11, 1928.
Gurney, W. B.—"Insect Pests of Cotton in New South Wales." N.S.W. Agric. Gazette, 35, 1, p. 53, 1924.

Phylloxera-Resistant Vine Stocks

The Choice of a Stock

By F. de Castella.

WHEN choosing a stock the suiting of the stock to climate and soil must be considered. As pointed out previously (June, 1936), each American vine sort, whether pure species or hybrid, is really suited by a narrower range of conditions than were the old vines of Europe, all of which belong to the one species, *Vitis Vinifera*.

Climate.

The American vine can be grown in a wide range of temperate to warm climates. It is able to survive severe winter cold, intense summer heat, and dearth of soil moisture, but for satisfactory financial results in the commercial vineyard, this range narrows down in marked manner, and wide differences are found between the various stocks.

Each American species has a habitat of its own in the vast North American Continent and is naturally best suited by climatic conditions approximating to those of the region where it grows wild. In the cold north, extending into Canada, are found *V. Labrusca* and *V. Riparia*, the latter occurring throughout a much larger area than the former. Further south, where conditions are milder, grow *Aestivalis* and *Rupestris*, the latter extending even into Texas. In the hot Southern States are found *Candicans*, *Berlandieri*, *Monticola*, *Cordifolia*, *Cinerea*, *Rubra*, *Arizonica*, and *Linececumii*, which are essentially hot climate vines. Under tropical conditions we find such other species as *Coriacea*, *Caribaea*, and the two Muscadinia vines, *Rotundifolia* and *Munsoniana*, which scarcely rank as true vines.

Hybrid vines constitute the great majority of stocks used in vineyard practice to-day ; in such the influence of each species is profoundly modified. The characteristics of the parents are blended, sometimes almost equally, though the offspring often leans more towards one parent in some important feature or aptitude. In hybrids between natives of cool and hot regions the most variable results may occur, each individual seedling has its own special aptitudes.

Our knowledge of American vines is largely based on French experience, which has been gained in a country colder than ours, where vines indigenous to the northern parts of the United States found congenial surroundings. Attention was first turned to *Labrusca* and *Riparia*, and also to *Aestivalis* and *Rupestris* of milder climate origin, but the natives of the warm Southern States were entirely neglected. It was only after Viala's mission to America and his advocacy of *Berlandieri* for limy soil, that serious attention was turned to them. This species, together with *V. Cordifolia*, *V. Monticola*, &c., are essentially hot climate vines. Refractory cutting strike and incomplete ripening of the wood, in the colder French climate, militated for a time against their practical use. Both defects were corrected, or rather mitigated, by cross breeding, so that they are now mainly represented by hybrid descendants, which retain, in large measure, certain precious attributes of these species—attributes that present more interest under our Australian sun than in colder France.

V. Rupestris soon eclipsed *V. Riparia*, which remains to us in hybrid form only. But *Rupestris* also has its limitations. It certainly grows wild in warm regions such as parts of Texas, but its drought resistance is not high. It demands deep soil where its roots can plunge and find sufficient moisture ; otherwise it may suffer much from drought. Other species such as *Berlandieri* and *Monticola*, for limy soils, and *Cordifolia*, for soils of low lime content, show greater drought resistance, and this is combined with valuable qualities in other directions. Others again such as *Cineria* and *Candicans*, that have played but a small part in the raising of those hybrid vines now in general use, would seem to offer potentialities not yet realized. The raising of new hybrids, specially suited for difficult cases under our Australian climate, that retain some of their precious qualities, might have far reaching results, and should constitute a new avenue well worth exploring.

A characteristic that depends largely on geographical origin is the date of ripening of

the fruit, it is communicated in large measure by the stock to the scion sort grafted on it. Cold climate vines blossom and ripen early, while those from hot regions are late. Earliness is usually desirable for table grapes; hence the popularity of *Riparia* with grape growers near Sydney. In some cases, however, late grapes are profitable. By judicious selection of the stock, the date of ripening can be appreciably advanced or retarded.

For wine grapes the position is more complicated. Earliness is desirable in a cool climate where ripening must commence before the weather becomes too cold. Its advantage disappears in warmer regions, with longer ripening season. Early stocks cease growth sooner than late ones; leaf fall may commence before maturity is complete. Though ripening may commence sooner it may not reach so satisfactory a stage as on a later stock that retains the foliage longer. This aspect will be further considered in connexion with the influence of the stock on quality.

It will thus be seen that Australian problems concerning adaptation to climate are somewhat different from those met with in France; the most advantageous stocks under our warmer and drier conditions are not necessarily those that are most popular to-day in that colder country. Gratifying as is the success already achieved with our hitherto most popular stocks A.R.G. 1, 1202, 3309, 3306, and du Lot; others seem destined to give even better results. Foremost among these are hybrids of hot climate species, such as 420A and several other *Berlandieri* x *Riparias*, the *Berlandieri* x *Rupestris* group, such as R.99, R.110, &c.; such *Cordifolia* hybrids as 125–1, 107–11, 106–8, &c.; the *Monticola* hybrids 18804, 160–19, &c., and such complex cross breeds as 554–5, 150–15, &c. The ameliorative influence of these stocks on the quality of the wine is a point of very real importance.

Soil.

In the matter of their adaptation to the soil the wild vines of America show even greater divergence than in relation to climate, important though its influence undoubtedly is. The hybrid stocks in use to-day vary similarly; suitability or otherwise for a given soil depending largely on breeding.

A stock that thrives admirably in one soil may fail completely in another, of seemingly equal fertility, dying out after a few years of stunted growth; in less extreme cases it may do moderately well, but giving results far inferior to those obtainable from a stock better suited to that particular soil.

In a general way a distinction must be made between soils that are "easy" and those that are "difficult." In the former almost any vine will thrive, giving at least reasonable results. In the latter strict discrimination must be shown, the choice being limited, in many cases, to a very few stocks. This reaction to soil conditions depends on two main aspects; on chemical composition, which is in close relation to geological origin, and on physical nature in such directions as looseness or penetrability and the mutual relations of soil and subsoil.

As regards chemical composition, the outstanding feature is lime content. American vines do not tolerate this element as did the Vinifera sorts of Europe which thrive in soils containing as much as 80 per cent. lime carbonate (44·8 per cent. as lime, CaO), such as are found in some vineyards in Cognac and Champagne (France) where the land is mainly chalk.

Some American species are fairly tolerant, others are quite intolerant of this element—as much so as heaths and chestnuts; on soils containing so moderate a quota as 10 per cent. lime carbonate (5·6 per cent. as CaO) they suffer from chlorosis, a disease that proved the greatest obstacle to the general use of American stocks in the early days of French reconstitution. In that country the majority of the vineyard soils are of limy nature. In Victoria we have so far had no trouble with lime chlorosis, the vineyards that have been replanted being all on "low lime" soils. Limy soils occur in other districts, and their case must be considered.

Lime Chlorosis.

The story of chlorosis is one of the most interesting chapters of the history of French reconstitution. Before the American vine became necessary the very existence of such a disease was unknown. It is true that in some of the chalky vineyards of Cognac and Champagne, yellowing of the foliage had been sometimes noted in a cold wet spring, but it disappeared as the season advanced and no harm resulted. Far different is the result with many resistant stocks. According to Viala "this disease that, before the Phylloxera crisis, was an insignificant accident, has become, with the culture of grafted American vines, an obstacle to the reconstitution of many vineyards in divers wine regions of France, an obstacle that was long looked upon as insurmountable."

Picking sultanas in the Swan Hill district.

When, in the late eighties, the grafted vine was at last coming into its own, and *V. Riparia* was hailed with enthusiasm for results hitherto unhoped for from earlier stocks, it was confidently believed that the Phylloxera problem had been solved at last. This general satisfaction was, however, damped by recognition of the fact that success was far from general. In many vine-yards, with seemingly excellent soil for the vine, failure had to be admitted. It became evident that American vines did not thrive in certain soils. Though the reason is to-day quite obvious, it was some time before it was understood in France. Many different explanations were given for the yellowing, decline, and even death of the vine, to which the name chlorosis was given. It was said that the American vine could not acclimatize itself to its new surroundings; cold and wet spring weather was blamed; likewise alternations of heat and cold, faulty drainage and water-logging of the soil in spring, and many other causes. The yellow colour, indicative of reduced chlorophyll content, suggested lack of iron; yet analysis showed that the yellow vines often contained more iron than normal ones.

B. Chauzit drew attention in 1889 to the close correlation existing between chlorosis and high lime content, and henceforth this explanation has been universally accepted. Viala and Ravaz point out (*Vignes Americaines*, page 33), after discussing the manner in which an excess of lime might bring about the disappearance of chlorophyll known as chlorosis. "However, this may be and though this question is not sufficiently elucidated, carbonate of lime is indeed the true cause of chlorosis." They also state categorically (page 30) "what is certain and absolutely constant is that this disease never manifests itself except in calcareous soils, the higher the proportion of this element the more intense is the disease. Never have we seen vines become yellow elsewhere than in limy soils." The reaction of different plants to lime varies enormously. This element is, of course, indispensable to all of them; none can grow normally in its absence. The proportion that is necessary is, however, very small; less than 1 per cent. is ample for any vine. It is only when the soil content considerably exceeds this quota that the question of lime tolerance assumes importance.

Distinctions are made in France between plants that are *Calciphile* or lime loving, *Calcicole* or lime tolerant, and *Calcifuge* or lime hating. The majority of plants are indifferent to lime or calcicole; they tolerate a high proportion in the soil. Others, such as the heath, the chestnut, and most American vine species, are decidedly calcifuge; they suffer and may even die, in soils containing lime in excess. No vines are really calciphile; none of them need much lime, they are at best calcicole, and *V. Vinifera* dominates all others in this respect. Nearly as tolerant as *Vinifera* are the American species *V. Berlandieri* and *V. Monticola*, less so are *V. Arizonica* and *V. Coriacea*. The others are intolerant. It is curious that *V. Cinerea*, *V. Cordifolia*, and *V. Candicans*, though able to grow wild in limy soils in their hot, dry natural habitat, have proved definitely calcifuge in the colder and wetter French climate. *V. Aestivalis*, *V. Lincecumii*, *V. Rubra*, *V. Bicolor*, and *V. Labrusca* are intolerant. *V. Riparia* usually tolerates 10 per cent. of lime carbonate in a finely divided state and rather more if coarser. *V. Rupestris* is distinctly calcifuge in its pure forms, though *Rupestris du Lot* and some other selections can tolerate even more than *V. Riparia* —up to 25 per cent., a feature that would seem to support the *Monticola* affiliation sometimes claimed for du Lot. In hybrids the influence of the parents is necessarily modified. Though usually intermediate between them, there are cases where the cross may show higher tolerance than either parent. Thus, Nos. 3306 and 3309 (*Rip.* x *Rup.*) are distinctly more tolerant than *V. Riparia*, and very much more so than the pure forms of *V. Rupestris*, almost equalling du Lot in this respect.

As might be expected, the *Berlandieri* and *Monticola* hybrids are highly tolerant; *Vinifera* x *Berlandieri*, especially so *Berlandieri* x *Riparia* somewhat less, and *Berlandieri Rupestris* still less, yet sufficiently so for many very limy soils.

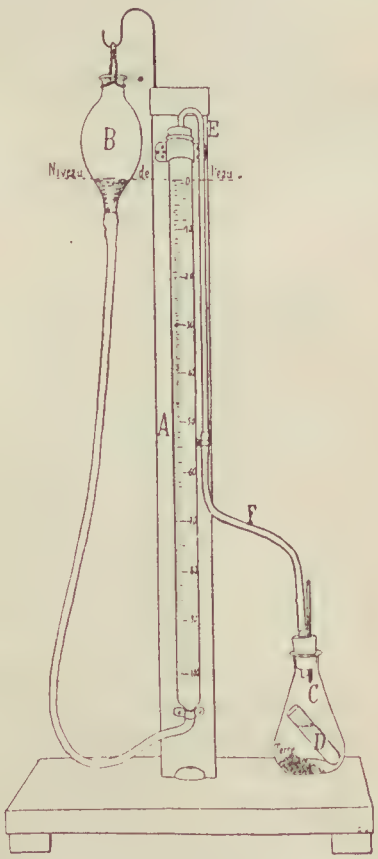
Chlorosis is thus a nutritional disease, due entirely to the action of lime, on vines intolerant of this element. Though lime is clearly at fault its mode of action has not been explained quite satisfactorily. Viala and Ravaz hold that decreased leaf acidity hinders cell functions, with resultant impoverishment in nitrogen and carbohydrates. Chlorophyll disappears and the formation of chloroplasts ceases. Molz also blames neutralization of sap acidity. The leaves of affected vines contain less potash, but more iron than normal ones; the increase in iron is curious in view of the decidedly mitigating action on the disease, of applications of iron sulphate to foliage, soil or better still to pruning wounds in late autumn. According to Perold, chlorosis is not due to a lack of total iron but of dissolved iron, which becomes less soluble in the neutral or faintly alkaline sap, due to lime in excess.

Chlorisis must not be confused, as it often is, with variegation (*Panachure* in French) that sometimes occurs on *Rosaki* (Waltham) and some other vines, and is on a par with that of such garden plants as Aucuba, &c. The two are altogether different in symptons, as also in origin. Instead of being parti-coloured the leaves of chlorosed vines are usually of a more uniform tint, pale yellowish-green at first, becoming gradually yellower until nearly white, brown bands may appear between the veins. In severe cases vegetation is much depressed, growth is scrubby and stunted with numerous laterals and very small, deformed leaves; this extreme form is often known as *Cottis*; it soon results in the death of the vine.

In less severe forms, where the lime content is only slightly above what the stock can tolerate, symptoms are limited to slight yellowing in early spring, especially if the season be a cold, wet one; with the advent of better weather the leaves become green again and the grapes ripen normally. In such cases curative treatment is quite effective.

Chlorosis is aggravated by certain factors and mitigated by others. The texture of the lime carbonate is of very great importance, more so indeed than its actual percentage. The finer the particles the more harmful will it prove, the greater surface permitting more rapid solution by the soil water. Hence it is that chlorosis is particularly acute in chalky soils; much more so than in those where the lime is in fragments of larger size such as coarse sand or gravel.

The percentage of lime is conveniently determined in France by means of calcimetres, such as that of Bernard. The volume of carbon dioxide (CO_2) gas, liberated from a given weight of soil by a tartaric acid solution, indicates the lime content with sufficient approximation. Such instruments can show the total lime content only, which is far from an accurate guide as to its *chlorosive* power, which depends, as we have seen, largely on the size of the lime particles. This governs what is known as the "rate of attack" which is expressed in milligrammes of lime carbonate, dissolved per second, by a 25 per cent. solution of tartaric acid solution, acting on one gramme of the soil to be tested. By multiplying the lime carbonate percentage by the rate of attack, a factor is obtained known as the chlorosive power of the soil. Houdaille's registering calcimetre is based on the liberation of carbon dioxide gas, as is Bernard's, but the time element is introduced and by means of a



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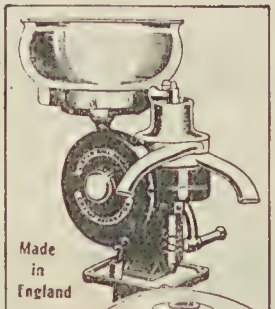

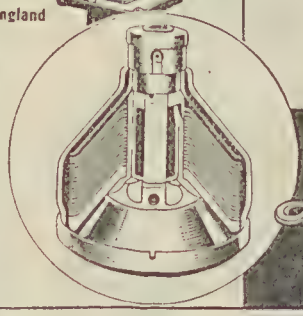

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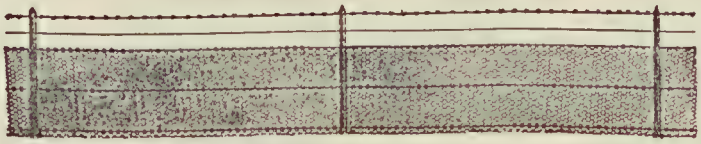

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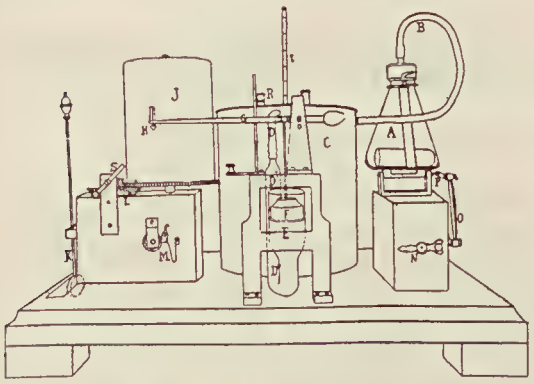


Houdaille's registering calcimetre.

rotating drum and pen, the rate of attack is automatically recorded in the form of a graph. The determination of the chlorosive power of the soil, with this instrument, has proved of great assistance in selecting suitable stocks for such highly chlorosive soils as the chalks of Cognac and Champagne.

Several factors are capable of aggravating or mitigating this harmful influence of lime. The chief of these is moisture, the influence of which is very considerable. Owing to the carbon dioxide it contains, the soil water can dissolve lime carbonate, which reacts on vines that are not tolerant. According to Houdaille and Semichon, when soil saturation reaches 50 per cent., chlorosis is almost certain with vines that are susceptible, even in soil not very rich in lime. Hence a cold, damp soil aggravates chlorosis in very marked manner; it seldom occurs under dry conditions unless the soil be extremely calcareous. A vine that suffers from a moderate lime content in a cool, moist climate may tolerate far more of this element in a warm, dry one. Thus is explained the occurrence of *V. Cordifolia* and *V. Cinerea*, in the wild state, even in chalky soils, in warm, dry Texas. Planted on much less limy soils in the more humid climate of France, these vines become stunted and even die.

Seasonal influence is on similar lines; a stock may show no alarming symptoms in a warm, dry year, yet become intensely yellow in a wet one. It is in spring, when soil moisture is abundant, temperature rather low, and growth active, with tissues soft and tender, that yellowing of the foliage is most marked. Later on these symptoms are less noticeable or may disappear altogether. This influence of moisture should not be overlooked in our irrigated vineyards. Heavy spring waterings are favorable to chlorosis in limy soils. They should be avoided unless the stock be a highly tolerant one.

The soil texture also plays its part; for equal lime content stiff soils are more chlorosive than loose ones, since they are more retentive of moisture, and also because root development is somewhat hampered. Clay seems, on the other hand, to have a mitigating influence, by forming a sort of coating around the lime particles. Sand has the reverse effect, as its grains tend to become lime coated. Physiologically alkaline fertilizers, such as nitrate of soda, increase liability to chlorosis.

The age of the vine influences susceptibility, which is greatest "at the second leaf." It diminishes as the vine gets older. A vine that was very yellow the second season may, in the following one, sprout green, but become yellow later, increasing in intensity until near blossom, but reverting later on to a normal green colour.

Vineyards that are field grafted suffer more than those planted with already grafted rootlings, for the reason that in the former case the influence of grafting, which is always somewhat debilitating, makes itself felt just at the period of maximum susceptibility, when the stock is in its second leaf. Any debilitating influence increases liability to chlorosis—the action of phylloxera, for example, on vines that do not possess very high resistance. If such are somewhat depressed by the attacks of the insect they may suffer from chlorosis, whereas they remain quite green in its absence.

Grafting weakens the vine, especially if affinity between stock and scion is not of a high order; if it be satisfactory, such action is slight but sufficient, nevertheless, to cause stocks to suffer after grafting, in soils where they thrive if not grafted. This has been particularly noticeable in the case of Riparia "mother vines" grown to produce cuttings. Such a result is somewhat curious in view of the very high lime tolerance of *V. Vinifera*, which might be expected to increase rather than reduce the lime tolerance of the stock. Each scion has a specific action of its own in this direction independently of affinity; some sorts increase, while others reduce the resistance of the stock to chlorosis. According to Chancrin, among very resistant scions are Carignane, Clairette, Cabernet, Chenin, Gamay, Malbeck, Merlot, Morrastel, Syrah (Shiraz), and Sauvignon. Moderate resistance is shown by Aramon, Cinsaut, Chardonnay, Durif, Marsanne, Pinot, Semillon, and Terret; whilst non-resisters include Alicante Bouschet, Chasselas, Folle, Melon, Meslier (Arbois), Mondeuse, Mataro, and Piquepoul.

Tillage can also play a part; especially summer cultivation, which aggravates chlorosis unless it be shallow.

If not too severe, chlorosis is amenable to curative treatment; iron, in the form of sulphate being the recognized specific. Broadcast, in crystals or powder, in early winter at the rate of one to two tons per acre, good results have been obtained on very limy soils. Lighter applications suffice if used in solution (1 to 1½ per cent.), a couple of gallons being poured into an excavation round each vine. This applies to the very closely planted French vines, with our wider planting about double this quantity would be needed for each vine. Sprayed on the foliage in ½ per cent. solution in spring or summer the green colour is restored to some extent. The action, though positive, is not very potent; it may be necessary to repeat the application. The strength of 1 per cent. cannot be exceeded or leaf scald would result.

What is known as Dr. Resseguier's treatment is, however, the standard method of applying iron sulphate to the vine. It consists in early pruning—after vintage, but before leaf fall; the cuts thus made are immediately swabbed with a strong solution of iron sulphate (30 to 40 per cent.). Advantage is thus taken of the negative sap pressure, or partial vacuum, in the vessels at the close of the growing season, and the vine is able to absorb sufficient iron to have a marked effect in preventing chlorosis in the following spring. Application can best be made on a calm, cloudy day when the solution does not dry too fast; being very corrosive it should be kept off the buds as much as possible.

The Resseguier treatment is widely practised in France; it is a valuable palliative that permits satisfactory results being obtained from certain stocks on land containing rather more lime than they could tolerate otherwise.

Attention has recently been drawn, in France, to the value of magnesia to prevent chlorosis—a proprietary substance called *Dolomagnesie*, at the rate of 2 lb. per vine, is reported to give excellent results. So long ago as the nineties it had been observed (Chauzit) that *V. Riparia* did not suffer from chlorosis in dolomitic soils rich in magnesia. Several recent articles by Dr. Armagnac, in *la Revue de Viticulture*, deal with the subject; he quotes Dumont, according to whom the action of magnesia against chlorosis is even greater than that of iron. For late application smaller quantities in the form of nitrate are recommended, its action being more rapid in soluble form.

Though the chlorosis question presents no practical interest in North-east Victoria, where the lime content of the soil rarely reaches 1 per cent., it is much higher in the Mallee and Wimmera where soils are met with containing more than 15 per cent. of lime carbonate, the usual Riparia limit. In such soils chlorosis must be reckoned with and the stock selected accordingly.

VICTORIAN LAMB—AN APPRECIATION.

The following is an extract of a letter received by Mr. Marshall, who last year sent a Victorian lamb to Mr. S. C. Howard, of London, through the Overseas Gift Scheme conducted by the Department of Agriculture :—

Dear Mr. Marshall,

I cannot resist taking this opportunity of tendering to you an expression of the pleasure, and interest, with which I examined and tasted the Australian sheep you so kindly sent over for Christmas.

I have had occasion in the past few years to purchase an average of fifty sheep a week for hotel consumption here, and was for some years a strong advocate of English lamb. I then moved over to New Zealand lamb, and have bought many of their best "X.L." Brand, and in the last few years have occasionally experimented with Australian lamb, but it seemed to me that in Australia you had not yet got on to the finer principles of refrigeration and grading quite as well, as in New Zealand, as shown in the product by the time it reached these shores. Indeed, as a lay observer, it appeared to me that you must be having trouble in the early stages of refrigeration, perhaps due to long treks before the meat is brought under cold influence. But in the lamb which you sent us was exemplified such progress that it seemed to me superior to anything I have before tasted, and I can assure you that the various remarks at the table when we tried this, were loud in praise of your country's product, and will I am sure, in a small way, have done somewhat to help expand your country's market in this country.

Yours sincerely,

S. C. HOWARD.

Orchard and Garden Notes

By Edward E. Pescott, F.L.S.

The Flower Garden.

One of the most important occupations in the flower garden at the present time is what might be termed the annual digging. The garden beds are dug over wherever possible, taking care not to unduly damage the roots of shrubs and other permanent plants. The garden litter, such as weeds, fallen leaves, and any grass clippings from the lawn, should be dug into the soil. It is a great waste to burn any of these. Of course, if it is available, any animal manure could be dug or trenched in during the digging operations.

It will be noticed in many parts of the State that up to the present time the subsoil is quite dry. Indeed, it has been found that many of the light rains which have fallen have not gone more than a few inches into the soil. It may be wise under these conditions to water some of the permanent shrubs and trees, particularly if they are evergreen. It is no use waiting for the rain to come if the plants are suffering from drought conditions. If water is not available, trenching in of any humus material will somewhat relieve the situation. If a good fall of rain has not been experienced, every permanent plant in the garden, particularly those which are of a more or less delicate character, such as Daphne, Hydrangea, or Rhododendron, should be given a good soaking.

All bulbs for spring flowering should now be planted, as the season is well advanced, and later plantings may delay or prevent the subsequent flowering.

The Orchard.

Orchard work should be carried out mainly on the lines of orchard hygiene as indicated last month. In connexion with this work, and in relation to stone fruits, it is very important that as many of the fallen leaves as possible should be gathered and burnt. A great deal of infection comes from fallen leaves, and particularly in the case of such diseases as shot hole, rust, and leaf curl. Where shot hole and rust have been prevalent, or where infection has been serious, it will be well to spray the trees with Bordeaux mixture at the 6–4–40 strength during the period immediately following leaf fall. This autumn spray has been found to be very important and effective. It is not intended that this shall supersede the spring spray, but is rather a subsidiary in order to kill any infection that may be reached on the trees at the present time.

A Daffodill.

The Vegetable Garden.

At the present time young generations of slugs and snails are developing in the garden. Where the beds have not been limed it will be wise to distribute over the whole garden one of the recognized preparations for dealing with these pests. These preparations are to be purchased in two forms, first in the form of dust, which is used for dusting both the plants and the soil, and which forms a very effective soil disinfectant. The second recognized method is the use of calcium arsenate in the form of baits. The arsenate is dusted over bran in the proportion of one part of calcium arsenate, by weight, to ten parts of bran. This is moistened with sweetened water, using either treacle or sugar for the sweetening. The former seems to attract the pests more than the latter. The baits should not be sticky nor lumpy, but should be scattered more or less in a loose form over the whole of the garden.

Professional Papers

[This section is devoted to professional papers and articles of a scientific character.]

Genetical Studies with Wheat—

Haploids of Triticum vulgare

By Alan R. Raw, M.Agr.Sc., Cereal Geneticist.

THE recorded occurrence of haploid sporophytes among the flowering plants is comparatively rare, confined as it is to less than a score of genera, including *Datura, Oenothera, Nicotiana, Solanum, Triticum, Hordeum, Digitalis, Crepis, Matthiola, Oryza,* and *Brassica.* The first appearance of a haploid sporophyte was recorded in 1922 (Blakeslee *et al.*), the plant concerned being *Datura stramonium.* In *Triticum* the phenomenon appears to be relatively common in comparison with other genera. Subsequent to the discovery of the original haploid of *T. compactum* (Gaines and Aase, 1926), similar aberrant plants have been recorded in the following wheat species:—*monococcum* (Kihara-Katayama, 1932, 1933, 1934, Chizaki, 1933), *turgidum* (Nakajima, 1935), *durum* (Vasiljev, 1936), and *vulgare* (Yamasaki, 1934, 1935). Vasiljev also refers to haploids of *T. persicum* and *T. dicoccum.*

The purpose of this paper is to record the occurrence of natural haploids of *T. vulgare* at the State Research Farm, Werribee, Victoria. These apparently originated as a result of environmental influences, and in this respect resemble those of *T. vulgare* (Yamasaki) and *T. monococcum* (Kihara-Katayama, Chizaki). The occurrence of sterile plants among normal pure line progenies of *T. vulgare* has been recorded on several occasions in the Stud Cereal Nursery at the State Research Farm, Werribee. During 1933, five such aberrant plants were observed in the variety Waratah (*T. v. alborubrum* Korn.). In 1935 two were isolated from the variety Free Gallipoli (*T. v. alborubrum* Korn.). In this season also a completely sterile plant was observed in a pure line culture of *Hordeum vulgare.*

During 1936, nine typical aberrant steriles were isolated from pure line cultures of *T. vulgare,* two from commercial strains, and the remainder from the F4 and F5 progeny of *vulgare* x *vulgare matings.* In all cases the aberrant plant differed from the parent form only in the degree of vegetative development, in colour of foliage, and in its sterility. In 1933, one plant produced three grains. These gave rise to normal fertile plants in the following season.

The appearance of the aberrant plants suggested their haploid nature, and in 1936 all

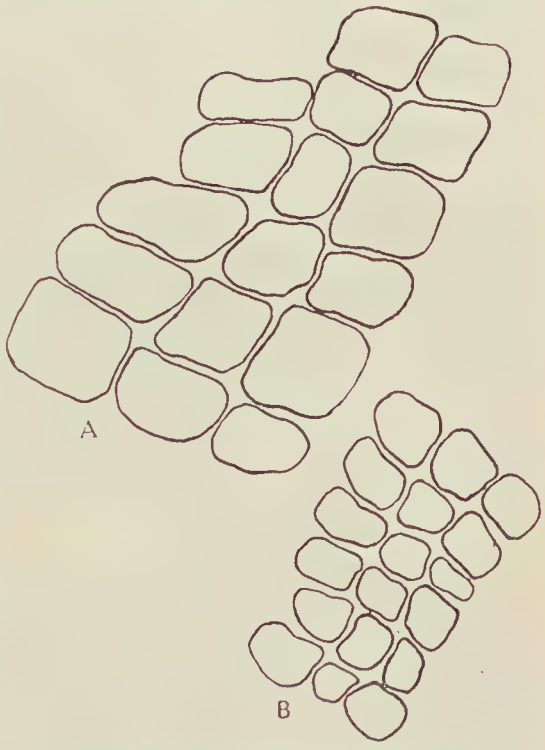


Fig. 1.—Cells from anther epidermis of A. diploid, B. haploid Triticum vulgare.

aberrant forms were subjected to cytological examination in the meiotic stages of the developing pollen grain. In all cases the material was fixed in Carnoy, and examined by Belling's aceto-carmine method.

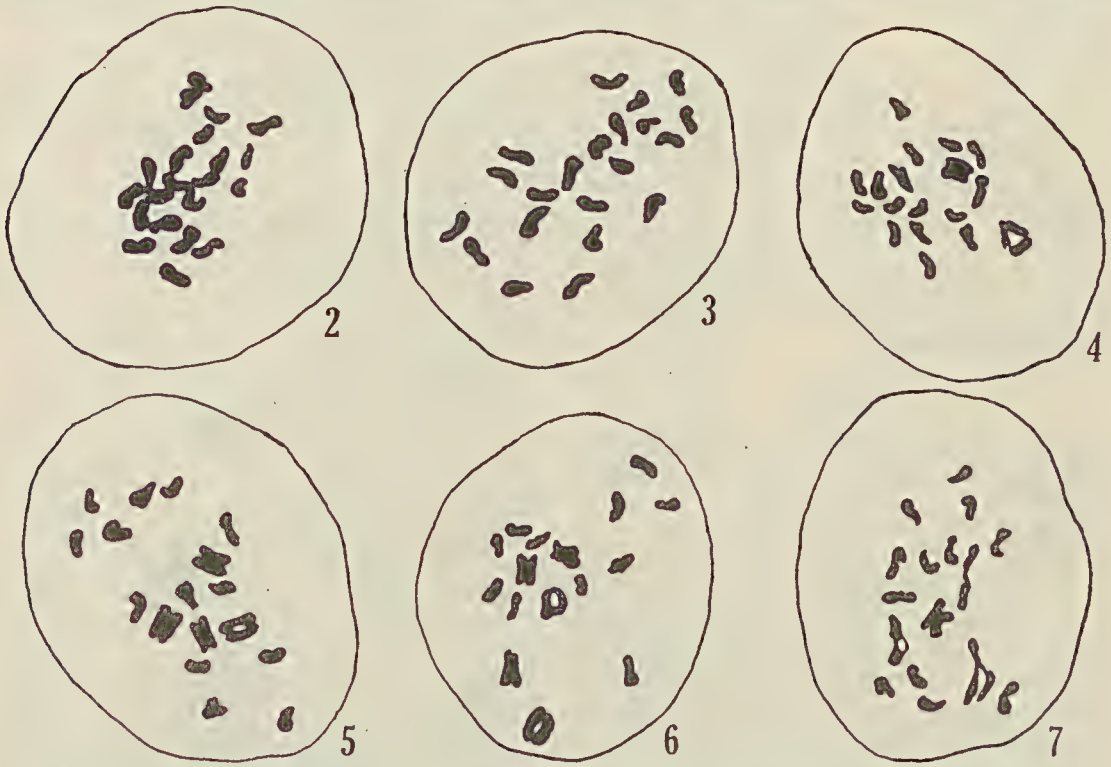
Description of Haploids.

Typically, the haploid resembles the diploid in all essential morphological characters, the only apparent difference being in the degree of development of the various characters. In general appearance the haploid may be described as a miniature diploid. A close examination of all haploid plants under observation revealed a striking resemblance one with the other in this regard. The results of a comparative study of the two conditions are presented in Table I.

It will be observed that the typical haploid plant is smaller than the diploid in all essential characters. In regard to the number of nodes per culm, the haploid is characterized by one less than the diploid. In general, the haploid exhibits complete sterility, though occasional grains may be formed. These invariably give rise to normal fertile diploid plants. The haploid is further characterized by excessive late vegetative vigour, and the plant will continue to produce ears until long after the normal time of maturity. This is evidently an attempt on the part of the sterile

Table I.—Haploid and Diploid Wheat Plants.—Comparative Measurements.

Character.	Haploid.	Diploid.
Height (average length of culm)	54·6 cm.	76·2 cm.
Nodes per culm	3	4
Diameter of culm—Base	·44 cm.	·52 cm.
Apex	·19 cm.	·28 cm.
Upper leaf—Length	13·2 cm.	18·0 cm.
Width	1·3 cm.	1·6 cm.
Rachis—Length	7·1 cm.	7·8 cm.
Spikelets per rachis	16	16
Outer glume—Length, base to shoulder	·78 cm.	·96 cm.
Awn—Length	1·4 cm.	2·0 cm.



Figs. 2 to 7.—First metaphase; Figs. 2 and 3, 21 univalent chromosomes; Fig. 4, 1 bivalent + 19 univalents; Fig. 5, 4 bivalents + 13 univalents; Fig. 6, 5 bivalents + 11 univalents; Fig. 7, 1 trivalent + 3 bivalents + 12 univalents.

Figs. 8 to 10.—First anaphase. Note uneven distribution to poles—(3 : 18), 10 : 11), (14 : 7).

organism to reproduce itself. The foliage, and more especially the flowering glumes of the haploid, are characterized by an intensive reddish-purple pigmentation, a character which readily attracts attention to them.

Fig. 11.—First telophase, showing uneven distribution of chromosomes (20 : 1).

The size of the individual cells is reduced, as compared with those of the diploid. This is illustrated in Fig. 1, which shows typical cells of the anther wall in the same stage of development. The haploid floral organs are greatly reduced, and the pollen is, in general, abortive. The ratio of the diameter of the diploid pollen grain to that of the haploid is as 1 : ·62 in the material investigated.

Cytology.

(Figs. 2 to 27 represent camera lucida drawings (× 850 approx.) of Triticum vulgare haploids.)

The meiotic divisions in the haploid are exceedingly chaotic in nature. The pollen mother cells are invariably smaller than those of the diploid. At diakinesis and metaphase of the first division there are 21 chromosomes present in comparison with the 21 pairs of the normal diploid (Figs. 2, 3, 4). Autosyndesis is relatively common, the number of bivalents present varying from 0 to 5, while occasional trivalents are observed. (Figs. 5, 6, 7.)

In the first division, the chromosomes are typically distributed over the entire spindle (Figs. 2 to 7), resulting in difficulty in distinguishing the different stages of the division. Distribution of the chromosomes to the polls occurs at random (Figs. 8 to 10), and is rarely in any way even. Occasionally, the bulk of the chromosomes will pass to one pole (Figs. 8, 10, 11), and, in rare instances, the entire complement may congregate in one daughter cell. This doubtless furnishes the explanation of the occasional seeds produced by these otherwise sterile plants. Lagging is typical (Fig. 14), and may result in the exclusion of the laggards from the daughter nucleus, and the formation of secondary nucleii in the cells. The chaotic distribution of the chromosomes may result in the formation of multipolar spindles (Figs. 12, 13).

In the second division, the behaviour of the chromosomes is more regular. The individuals arrange themselves in a more or less even plate, and each divides as in a typical homoeotypic division (Figs. 15, 16). Lagging is again apparent (Figs. 17, 18), and secondary nucleii are commonly observed. Where distribution in the first division has been more even, the resulting tetrads are normal in appearance (Fig. 20). This, however, is rarely observed.

Fig. 12.—First division. Note uneven distribution.

Typically, spore formation is very irregular, and, as a consequence of the irregular distribution of the chromosomes or chromosome groups, triads, pentads, and hexads are numerous, many of the cells being multi-

nucleate in character (Figs. 21, 22). The haploid pollen grain is invariably smaller than that of the diploid organism, and twinning and dwarfing are frequently observed (Figs. 23 to 27).

Fig. 13.—First division. Tripolar spindle.

Discussion.

The haploids under consideration resemble those recorded for *T. vulgare* by Yamasaki, in that they have originated as a result of environmental influences rather than as the outcome of artificial stimulation, such as was responsible for the production of those recorded by Gaines and Aase, Vasiljev, and Kihara-Katayamâ. Just what the particular environmental influence may be it is impossible to state definitely, but Chizaki has suggested the effect of high temperatures at flowering as the probable cause of his *T. monococcum* haploid. In this regard, he considers that the haploid originated either by the stimulation of the egg cells by pollen that had lost its fertilizing capacity on account of the high temperature, 35° C., or by parthenogenesis of the reduced egg cell, due to the stimulus of heat alone. It is significant that shade temperatures in excess of 30° C. are occasionally recorded at Werribee, during the flowering period of the wheat plant. On such occasions the plant in the field would be subjected to temperatures far in excess of 35° C. A shade temperature in excess of 35° C. was recorded on one day during the flowering period of 1935, and it seems reasonable, in view of Chizaki's evidence, that this supplied the necessary stimulus for haploid formation in that season. It is significant that in each season the haploids have been observed in populations having a similar date of flowering.

Fig. 14.—First telophase, showing lagging univalents.

By subjecting maize plants to temperatures of 40°–50° C. at fertilization, Randolph succeeded in inducing haploid formation. On the other hand, Blakeslee *et al.* suggest low temperatures at fertilization as a stimulus to haploid formation in *Datura*. In view of this, there appears to be little doubt that extremes of temperature do provide a sufficient stimulus to haploid formation in plants.

By analogy with the 1936 haploids it is evident that the aberrant plants observed in 1933 and 1935 were of similar constitution. Support is lent to this assumption by the character of the three plants, the progeny of the 1933 suspect haploids. Arising through the self-fertilization of a haploid parent, these plants would be completely homozygous diploids.

Fig. 15.—Second metaphase. Note low complement of right hand cell.

It would appear that haploid formation in *T. vulgare* is of relatively common occurrence. The rate of occurrence at Werribee appears to be in the region of .0001 per cent., based upon populations in excess of 10,000 individuals. This figure is considerably below that of Yamasaki, who records an occurrence of .025 for hybrid, and .029 for non-hybrid populations. For *T. monococcum*, Katayama records the high figure of .48 per cent. under natural conditions.

Fig. 16.—Second anaphase. Chromosomes dividing.

Probably the most striking feature of the haploid is the small effect produced upon morphological characters by the absence of an entire set of chromosomes from the organism. Apart from the sterility of the plant, the haploid is in appearance a miniature diploid. All

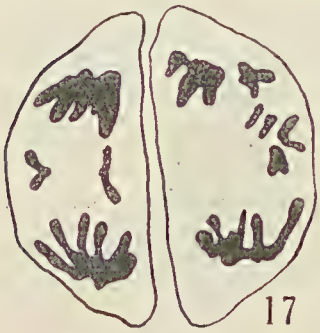


Fig. 19.—Second metaphase. Note dwarf microspore developing at apex.

Figs. 17 and 18.—Second telophase. Lagging chromosomes.

Fig. 20.—A tetrad.

characters are reduced in size, but otherwise are not affected. The reduced nature of the plant, its sterility, its excessive late tillering capacity, and its marked pigmentation characterize the haploid organism. It has been observed in practically every case studied that the haploid characters are similar to those of the diploid on a reduced scale. An extremely comprehensive summary of the early work with plant and animal haploids is furnished by Ruggles Gates and Goodwin.

Cytologically the haploid resembles the F1 progeny of certain intergeneric matings in its maturation divisions, e.g., *Triticum* x *Secale*. The meiotic stages of the nine haploids under consideration were essentially similar in regard to the behaviour of the chromosomes. The presence of bi- and occasional trivalents in the cells is at variance with the findings of most other workers with *Triticum*, but agrees very closely with those of Yamasaki for *T. vulgare*. The occurrence of these associated chromosomes in haploids of *T. vulgare* is important, since it furnishes further evidence of the occurrence of autosyndesis in the polyploid wheats. This was originally demonstrated by Kihara and Nishiyama in 1928. Autosyndesis has also been recorded in haploids of other polyploid species, including those of *Nicotiana*, *Solanum*, *Digitalis*, and *Brassica*.

The behaviour of the chromosomes in the haploids under consideration indicates the relationship existing between the different chromosome sets, and furnishes evidence in support of the polyploid origin of *Triticum vulgare*.

Summary.

1. Sixteen suspect haploid plants were isolated from pure line cultures of *T. vulgare* during the years 1933, 1935, and 1936. In 1935 a suspect haploid was observed in a culture of *Hordeum vulgare*.

2. The nine aberrant plants isolated in 1936 were studied cytologically in the meiotic stages of the developing pollen grain. All were found to possess a chromosome complement of 21.

3. Chromosome behaviour in the first division was chaotic in the extreme. In the second

Fig. 21.—A pentad with secondary nuclei.

Fig. 22.—A hexad.

Figs. 23 and 24.—Dwarf microspores.

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of Red Poll Cattle

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No. 1. VICTORIA DONALD. (AA, C.R.). Born 16th March, 1935 *Price* 40 guineas
Sire: Woodburn Peter Pan (Imp. in utero) (1504 AA). *Dam:* Victoria Rose Major (5AA). f.o.r. Werribee.
Victoria Rose Major produced 455 lb. butter-fat in 273 days, and 531 lb. in 365 days. (An AA Bull).

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Victoria Asphodel produced 322 lb. butter-fat as Jr. 4 (273 days).

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Sire: Chandpara Valentine (762 AA). *Dam:* Victoria Gratification (3022 A). f.o.r. Werribee
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Victoria Kosher produced 286 lb. butter-fat in 273 days as Sr. 3.

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Sire: Woodburn Peter Pan (Imp. in utero) (1504 AA). *Dam:* Victoria Royal Regal (3517 AA). f.o.r. Werribee
Victoria Royal Regal has produced 271 lb. butter-fat in 273 days as Jr. 3. (An AA Calf).

No. 6. VICTORIA OHM (A, C.R.). Born 25th October, 1936 *Price* 17 guineas
Sire: Victorian Gallant (1481 AA). *Dam:* Victoria Volt (4049 B). f.o.r. Werribee
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Prices are based on the average butter-fat production of the dam in 273 days, except in the case of progeny of heifers without completed test, the price then being 10 guineas.

An amount of 2 guineas per quarter maintenance has been added to calves 3 months old and over.

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By Flashdale (Imp.) (20576), by Dunure Footprint (15203 C.S.B.).
Flash Bute, Dam: Silver Bute (860 C.C.S.B.) by Baron Bute (Imp.) (15129 C.S.B.).
Grand Dam: Hiawatha Queen (C.C.S.B. 365) by Hiawatha of Australia (N.Z.S.B. 245).

1. Victoria Double Flash (Stallion)

Bright bay, foaled 24th October, 1932.
Sire: Flash Bute.
Dam: Victoria Lovelight (C.C.S.B. 2233) by Flashdale (Imp.) (C.S.B. 20576).
Grand Dam: Victoria Lovely (1604 C.C.S.B.) by Baron Wigton (Imp.) (13884).
This horse shows very good quality, and is a splendid mover.

2. Victoria Pasha

Dark bay, foaled 9th September, 1933
Sire: Flash Bute.
Dam: Victoria Patti (C.C.S.B. 1611) by Baron Wigton (Imp.) (C.S.B. 13884).
Grand Dam: Patricia (C.C.S.B. 714) by Baron Bold (A.C.S.B. 27).
A reachy colt with splendid conformation.

3. Victoria Lascar

Blue roan, foaled 3rd November, 1933.
Sire: Flash Bute.
Dam: Vic. Luscious (C.C.S.B. 1607) by Baron Wigton (Imp.) (13884 C.S.B.).
Grand Dam: Lucilla (C.C.S.B. 554) by Baron Bold (A.C.S.B. 27).
A heavy boned, weighty colt.

4. Three-year-old Colt

Sire: Flash Bute.
Dam: Duchess of York (C.C.S.B. 2230).
Grand Dam: Royalty (836 C.C.S.B.) by Baron Wigton (13884 C.S.B.).

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division it more nearly approached that of a typical diploid.

4. From 0 to 5 bivalents and odd trivalents were observed in the cells. The formation of multipolar spindles, and the presence of

Fig. 25.—A diploid microspore.

laggards, were typical. The irregularities observed resemble those occurring in the progeny of intergeneric matings.

5. The prevalence of autosyndesis is parallel in haploids of other polyploid species.

6. Complete, or almost complete, sterility, reduced size, excessive late tillering capacity, and pigmentation of the glumes characterize the typical haploid of *T. vulgare*.

7. The occasional seed produced by the haploid organism gives rise to fertile diploid plants which are completely homozygous.

8. It is considered that the stimulus to haploid formation at Werribee is provided by occasional excessively high temperatures during the flowering period of the wheat plant.

9. The rate of occurrence of haploids of *T. vulgare* at Werribee is in the region of .0001 per cent.

Fig. 26.—A haploid microspore.

Fig. 27.—Twin microspores.

References.

Belling, J., and Blakeslee, A. F. (1927).—"The Reduction Division in Haploid, Diploid, Triploid, and Tetraploid Daturas." Proc. Nat. Acad. Sci., 9.

Belling, J., and Blakeslee, A. F. (1927).—"The Assortment of Chromosomes in Haploid Daturas." Cellule, 37.

Blakeslee, A. F., Belling, J., Farnham, A., and Bergner, D. (1922).—"A Haploid Mutant in Jimson Weed, *Datura stramonium*." Science, 55.

Buxton, B. H., and Darlington, C. D. (1932).—"Behaviour of a New Species *Digitalis mertonensis*." New Phytol.

Chipman, R. H., and Goodspeed, T. H. (1927).—"Inheritance in *Nicotiana tabacum*, VI." Univ. Calif. Pub. Bull. 11.

Cuizaki, Y. (1933).—"On the Occurrence of a Haploid Plant in *monococcum* Wheat." Proc. Crop Sci. Soc., Japan, 5.

Clausen, R. E., and Mann, M. C. (1924).—"Inheritance in *Nicotiana tabacum*, V." Proc. Nat. Acad. Sci., 10.

Gaines, E. F., and Aase Hannah (1926).—"A Haploid Wheat Plant." Amer. Jour. Bot., XIII.

Humphrey, L. M. (1934).—"The Meiotic Divisions of Haploid, Diploid, and Tetraploid Tomatoes, with Special Reference to the Prophase." Cytologia, 5.

Johansen, D. H. (1934).—"Haploids in *Hordeum vulgare*." Proc. Nat. Acad. Sci., Wash., 20.

Jorgensen, C. A. (1928).—"The Experimental Formation of Heteroploid Plants in the Genus *Solanum*." Journal Genetics, 19.

Katayama, Y. (1934).—"Haploid Formation by X-Rays in *T. monococcum*." Cytologia, 5.

Kihara, H., and Nishiyama (1928).—"New Aspects of Chromosome Behaviour in Pollen Mother Cells of tri, tetra, and pentaploid wheat hybrids." Bot. Mag., Tokyo, XLII.

Kihara, H., and Katayama, Y. (1932).—"On the Occurrence of Haploid Plants in *T. monococcum*." Kwagaku, Japan, 2.

Kihara, H., and Katayama, Y. (1933).—"Maturation Divisions in a Haploid *T. monococcum*." Agric. and Hort., Japan, 8.

Kostoff, D. (1936).—"Studies on Polyploid Plants, XIII., Haploid *Nicotiana rustica*." C.R. (Doklady) Acad. Sci., U.R.S.S., 1.

Lammerts, W. E. (1934).—"On the Nature of Chromosome Association in *N. tabacum* haploids." Cytologia, Tokyo, 6.

Lesley, M. M., and Frost, H. B. (1928).—"Two extreme 'small' Matthiola Plants." Amer. Nat., 62.

Lindstrom, E. W., and Koos, K. (1931).—"Cytogenetic Investigations of a Haploid Tomato, and its Diploid and Tetraploid progeny." Amer. Jour. Bot., 18.

McCray, F. A. (1932).—"Another Haploid *N. tabacum* Plant." Bot. Gaz., 93.

Morinaga, T., and Fukushima, E. (1933).—"Karyological Studies on a Spontaneous Haploid Mutant off *Brassica napella*." Cytologia, 4.

Morinaga, T., and Fukushima, E. (1934).—"Cytological Studies on *Oryza sativa*." Jap. Jour. Bot., 7.

Morrison, G. (1932).—"The Occurrence and Use of Haploid Plants in the Tomato, with especial reference to the variety Marglobe." Proc. 6th Int. Cong. Genet., N.Y., 2.

Nakajima, G. (1935).—"Occurrence of a Haploid in *T. turgidum*." Jap. Jour. Genetics, 11.

Nakamura, S. (1933).—"Haploidy in the Rice Plant." Jap. Jour. Genetics, 8.

Ramiah, K., Parthasarathi, N., and Ramanujen, S. (1934).—"Haploid Plants in Rice." Jour. Ind. Bot. Soc., 13.

Randolph, L. F. (1932).—"Some Effects of High Temperature on Polyploidy and other Variations in Maize." Proc. Nat. Acad. Sci., Wash., 18.

Ruggles Gates, R., and Goodwin, K. M. (1930).—"A New Haploid Oenothera, with some considerations on Haploidy in Plants and Animals." Journal Genetics, 23.

Ternovsky, M. F. (1935).—"Interspecific Hybridization in Nicotiana." Bull. App. Bot., Leningrad, Ser. II.

Vasiljev, B. (1936).—"A Haploid Plant of Durum Wheat, *T. durum*." C. R. (Doklady) Acad. Sci., U.R.S.S., 1.

Weber, J. M. (1933).—"Cytological Features of *N. glutinosa haplonts*." Jour. Agric. Res., 47.

Yamasaki, Y. (1934).—"A Haploid Plant of Common Wheat." Cytologia, 5.

Yamasaki, Y. (1935).—"Cytological Studies on Haploid Wheat Plants." Jap. Jour. Genetics, 11.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

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Herd Number.	Name.	Address.	Number in Herd.	Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	259	6	Lady Talbot Milk Supply Company	Cranbourne ..	418
2	Warragul High School	Warragul ..	35	7	Mailer, Dr. Ramsay ..	"Maneroo," Shepparton	92
3	Payne, A. E. T. ..	"Yarra View," Lilydale	80	8	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	99
4	Dennis, Mrs. A. A. ..	Frankston ..	14	9	Harris, J. W. ..	"Rowena," Clyde	72
5	Slaney, H. B. ..	Mornington ..	85				

Standard Herd Records

For Quarter ended 31st March, 1937

In the following is set out the records of all cows which completed a lactation during the quarter. The number is 214, of which 151 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies according to the age of the animal (up to five years at time of calving), the standard being as follow:—

Junior 2 year old (under 2½ years at time of calving)	230 lb. butter fat.
Senior 2 year old (between 2½ and 3 years at time of calving)	250 lb. butter fat.
Junior 3 year old (between 3 and 3½ years at time of calving)	270 lb. butter fat.
Senior 3 year old (between 3½ and 4 years at time of calving)	290 lb. butter fat.
Junior 4 year old (between 4 and 4½ years at time of calving)	310 lb. butter fat.
Senior 4 year old (between 4½ and 5 years at time of calving)	330 lb. butter fat.
Mature cow 5 years and over	350 lb. butter fat.

(Except where otherwise stated, the period of Test was 273 days.)

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Atkinson, W. K., Swan Hill, Dairy Shorthorn (4).										
Willow Park Camelia 11th	D.S.H.B.	30.3.36	17½	5,868	4·40	257·95	250	Sr. 2	.. ..	Willow Park Silvermine 4th
Willow Park Countess 14th	D.S.H.B.	5.4.36	20	6,239	4·01	250·37	230	Jr. 2	.. ..	Willow Park Silvermine 4th
Willow Park Duchess 27th	D.S.H.B.	15.4.36	25	6,435	3·76	242·08	250	Sr. 2	.. ..	Willow Park Silvermine 4th
Willow Park Moss Rose ..	D.S.H.B.	9.4.36	32	10,517	4·10	431·61	350	Mature	404, 424, 471, 521, 612, 550, 580, 512, 424	Havelock of Darbalara
Black (Mrs.), A. J., Noorat, Jersey (1).										
Noorat Air Lady ..	36909	3.4.36	21½	6,635	5·45	361·53	350	Mature	326, 379, 370	Air Lord of Banyule
Black, I. S., Noorat, Ayrshire (3).										
Mount Noorat Alert ..	24144	9.6.36	12½	7,359	4·46	328·18	350	Mature	295, 385, 356	Scottish Major of Gowrie Park
Mount Noorat Georgina 3rd	27556	24.4.36	7	6,419	4·71	302·58	270	Jr. 3	255 ..	Gowrie Park Scottish Hero
Mount Noorat Janice 2nd	26587	16.4.36	21½	9,450	4·15	392·30	330	Sr. 4	416, 367 ..	Gowrie Park Scottish Hero
Box, Dr. J., Estate of the Late, Whittlesea, Jersey (3).										
Melrose Handsome Girl 18th	49481	19.5.36	14	5,175	6·00	310·73	270	Jr. 3	301 ..	Melrose Gold Reef
Toorongo Gay Girl 2nd ..	42262	9.4.36	22½	6,449	5·62	362·45	330	Sr. 4	231, 344 ..	Toorongo Mercedes King
Toorongo Sage	C.R.	22.6.36	11½	4,656	5·52	256·89	230	Jr. 2	.. ..	Kantara Don Juan
Broad, A. A., Sutton Grange, Jersey (1).										
Grangelea Machree ..	44173	20.5.36	17½	5,904	6·54	386·01	310	Jr. 4	269, 331 ..	Grangelea Daffodil's Hero
Calf, A. J., Werribee South, Jersey (1).										
Spring Vale Countess 4th ..	Vol. 24	6.6.36	21½	6,168	5·10	314·85	230	Jr. 2	.. ..	Laura Choir Boy
Chadderton, J. E., Hamilton, Jersey (4).										
Glen Leigh Dawn ..	33094	12.6.36	17	6,875	4·63	318·11	350	Mature	328, 356, 393, 394	Strathkellar Topthorn
Glen Leigh Destiny ..	37036	1.5.36	23½	6,612	5·51	364·56	330	Sr. 4	353 ..	Strathkellar Topthorn
Glen Leigh Dewdrop 2nd ..	39841	3.6.36	15½	6,620	5·15	341·18	310	Jr. 4	278, 286 ..	Strathkellar Topthorn
Glen Leigh Dolly ..	39843	30.4.36	17½	6,624	5·15	341·17	310	Jr. 4	273, 336 ..	Strathkellar Topthorn
Chitty, C., Kongwak, Jersey (1).										
Ewelme Master's Enid ..	48093	3.6.36	4	4,683	6·05	283·14	290	Sr. 3	263, 321 ..	Northern Master of Glen Iris
Clark, F. W., Toora, Jersey (1).										
Elanora Lilac 2nd	47937	27.4.36	18	6,914	6·49	449·01	290	Sr. 3	354 ..	Burnside Harmony
Clark, P. W., Whittlesea, Jersey (2).										
Coodardy Gentle Annette ..	37088	10.4.36	21½	7,706	4·36	336·07	350	Mature	293, 165, 301	Kantara Don Juan
Wompini Southern Fascination	46746	22.4.36	19½	6,930	5·82	403·04	310	Jr. 4	248 ..	Staghorn Butter's Masterpiece
Colenso, L. W., Alvie, Jersey (9).										
Braemar Vanilla 3rd ..	33743	6.6.36	14	6,320	5·76	364·19	350	Mature	324, 369 ..	Avonleigh Queenie's Twylight
Normandie Buttercup 2nd	33188	10.4.36	19	6,350	5·90	374·78	350	Mature	317, 486, 412, 447, 475	Peer of Lewisham
Normandie Buttercup 5th	45470	14.4.36	8½	4,459	5·81	258·92	290	Sr. 3	288 ..	Normandie White Peer

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Colenso, L. W., Alvie, Jersey.—*continued.*										
Normandie Golden Nancy	49868	13.5.36	19½	6,267	5·68	356·09	270	Jr. 3	352 ..	Normandie Golden Peer
Normandie Hawthorn ..	33190	28.4.36	10	5,343	5·49	293·24	350	Mature	320, 427, 395, 381, 397	Peer of Lewisham
Normandie Hawthorn 4th	45471	28.5.36	15½	6,792	5·42	367·82	290	Sr. 3	383 ..	Peer of Lewisham
Normandie Mayflower 4th	33194	21.4.36	19½	6,663	5·34	356·06	350	Mature	376, 286, 381, 389	Normandie White Peer
Normandie Mayflower 6th	45473	20.6.36	15½	7,742	4·96	384·29	310	Jr. 4	274, 416 ..	Normandie Majestic
Normandie Primrose 3rd ..	45474	7.4.36	13½	5,834	5·58	325·46	290	Sr. 3	280, 335 ..	Peer of Lewisham
Coughlin, C., Catani, Jersey (4).										
Glady's Park Fairy ..	C.R.	12.4.36	9½	4,992	5·65	281·89	230	Jr. 2	.. ..	Glady's Park Jessie's Masterpiece 2nd
Glady's Park Master's May	43039	21.6.36	9½	4,215	6·65	280·44	310	Jr. 4	323, 341 ..	Werribee Blue Bell's Masterpiece
Glady's Park Rosebud ..	48215	20.6.36	12	5,027	6·50	326·62	290	Sr. 3	341 ..	Werribee Blue Bell's Masterpiece
Kooreena Lulu 6th ..	40582	23.6.36	16	6,951	5·85	406·61	350	Mature	336, 331, 415	Kooreena Orator
Coulthard, J. and Son's, Whittlesea, Jersey (3).										
Elmwood Merry Lark ..	C.R.	20.4.36	17½	5,878	6·18	363·04	270	Jr. 3	.. ..	Austral Valley Lord Larkspur
Walambra Boronia ..	55742	11.6.36	20	6,465	4·85	313·30	230	Jr. 2	.. ..	Clarendon Eyre Brigadier 3rd
Walambra Lady ..	C.R.	19.6.36	13	5,502	5·35	294·26	230	Jr. 2	.. ..	Banyule Airo
De La Rue, N. C., Weering, Jersey (2).										
Carnation of Colac ..	21239	19.6.36	19	6,668	5·04	336·11	350	Mature	267, 347, 316, 379, 443, 481, 448, 390, 419	Golden Twylish of Colac
Lucerne Vale Masterpiece's Trixie 9th	49250	4.4.36	11	5,078	5·10	259·23	250	Sr. 2	263 ..	Werribee Fancy Masterpiece
Department of Agriculture, Werribee, Friesian (3).										
Victoria Belfrey	5104	11.6.36	33	9,647	3·84	370·71	230	Jr. 2	.. ..	Victoria Joyous Mercedes
Victoria Jingle Bell ..	4288	20.5.36	33	11,490	3·19	366·20	310	Jr. 4	387, 304 ..	Victoria Joyous Mercedes
Victoria Sonorous Piebe ..	4289	29.5.36	46½	15,245	3·22	490·77	330	Sr. 4	441, 418 ..	Victoria Topnote
Department of Agriculture, Werribee, Red Poll (16).										
Victoria Agrestis ..	3889A	9.4.36	18	7,224	3·99	288·36	290	Sr. 3	238 ..	Dominion Bright Belgian
Victoria Algiers	3004A	21.5.36	14½	8,759	3·91	342·31	350	Mature	248, 263, 312, 331	Victoria Royal Ringer
Victoria Amarylis ..	2301A	9.4.36	19½	5,642	4·36	245·76	350	Mature	256, 286, 366, 368, 381	Vice Regal
Victoria Ambrosia ..	3891A	23.4.36	24	7,647	3·92	300·11	310	Jr. 4	224, 305 ..	Victoria Vice Captain
Victoria Blue Danube ..	Vol. 9	5.6.36	17½	6,480	4·53	293·42	230	Jr. 2	.. ..	Dominion Bright Belgian
Victoria Bodkin ..	Vol. 9	10.5.36	17½	5,568	3·88	216·12	230	Jr. 2	.. ..	Victoria Gallant
Victoria Bright Bess ..	3898A	9.4.36	13½	7,409	4·23	313·51	310	Jr. 4	223, 312 ..	Dominion Bright Belgian
Victoria Bright Blue ..	3011A	8.6.36	21	6,861	4·19	287·72	350	Mature	248, 291, 280	Dominion Bright Belgian
Victoria Daffodil ..	Vol. 9	6.6.36	19	5,751	4·55	261·56	230	Jr. 2	.. ..	Dominion Bright Belgian
*Victoria Enchantress ..	Vol. 9	19.6.36	4	3,180	4·12	131·13	230	Jr. 2	.. ..	Dominion Bright Belgian
Victoria Flirt	3906A	10.4.36	17	8,691	4·25	369·40	310	Jr. 4	248, 333 ..	Victoria Vice Captain
†Victoria Fragrance ..	3907A	5.6.36	..	5,640	3·65	206·04	290	Sr. 3	233 ..	Victoria Brilliance
Victoria Greta	3023A	22.6.36	26½	9,612	4·24	407·29	350	Mature	256, 341, 377, 349	Vice Regal
Victoria Marah	3915A	29.5.36	18½	7,744	4·34	336·34	330	Sr. 4	244, 332 ..	Victoria Royal Ringer
Victoria Separation ..	3926A	21.4.36	25½	8,492	3·93	333·41	330	Sr. 4	215, 279 ..	Dominion Bright Belgian
Victoria Whirl	Vol. 9	5.6.36	14	6,045	3·75	226·54	230	Jr. 2	.. ..	Victoria Gallant
Desmond, J. J., Rochester, Jersey (4).										
Macroom Ellen	37221	14.6.36	19	6,382	5·24	334·39	350	Mature	293, 360, 340	Belgonia Battery
Macroom Farm Lass 4th ..	53912	17.5.36	19	5,780	4·61	266·40	230	Jr. 2	.. ..	Macroom Mortimer
Macroom Love Bird 3rd ..	49326	25.6.36	15	6,378	4·96	316·09	270	Jr. 3	236 ..	Glenalvie Statesman
Macroom Love Bird 4th ..	C.R.	5.6.36	17	5,166	4·49	232·12	230	Jr. 2	.. ..	Macroom Premier 2nd
Dobson, R. J. M., Acheron, Jersey (2).										
Wattle Grove Sally ..	37238	5.4.36	31	9,528	5·10	485·49	350	Mature	341, 401 ..	Clarendon Eyre Eminent's Fortune Hunter
Wattle Grove Starbright ..	37239	12.4.36	24½	9,509	5·04	478·82	350	Mature	382, 411, 425	Clarendon Eyre Eminent's Fortune Hunter
Dookie Agricultural College, Dookie, Ayrshire (6).										
Dookie Ada	17773	25.5.36	29½	10,883	3·84	417·94	350	Mature	336, 312, 378, 479, 427, 424	Majesty of Burwood
Dookie Adella	Vol. 29	24.5.36	25	6,135	4·15	254·39	230	Jr. 2	.. ..	Tregorland Indispensible
Dookie Faith	27117	7.5.36	29	9,402	3·85	361·68	290	Sr. 3	368 ..	Dookie Patron
Dookie Floss	23668	12.5.36	19	8,513	4·08	347·28	350	Mature	406, 341, 444	Longerenong Laurie
Dookie Patsy	27120	22.6.36	33	11,966	3·82	456·69	310	Jr. 4	381 ..	Dookie Emblem
Dookie Dinah	23665	5.4.36	20½	9,329	4·10	382·22	350	Mature	371, 490, 413, 490	Dookie Pater

* 210 days in test, sold. † 240 days in test, sold.

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Dwyer, G., Balwyn, Jersey (2).										
Jubilee Freezia	40430	20.6.36	16½	8,250	5·15	425·15	350	Mature	206, 353, 372	Jubilee Wheatenlight
Karalee Elmira	48942	6.6.36	15½	7,104	6·07	431·26	310	Jr. 4	407 ..	Karalee Volunteer 6th
Fairchild and Clutterbuck, Tinamba, Jersey (4).										
Vaucluse Blossom 2nd ..	55697	5.5.36	16	4,910	6·02	296·02	270	Jr. 3	.. ..	Somerville Concentration
Vaucluse Empress 2nd ..	46568	17.5.36	19	6,314	5·42	342·29	310	Jr. 4	277 ..	Somerville Repeater
Vaucluse Kerchele ..	46569	8.5.36	19	6,014	6·00	360·75	310	Jr. 4	290 ..	Somerville Concentration
Vaucluse Princess ..	55699	11.4.36	18	4,472	5·67	253·41	230	Jr. 2	.. ..	Paisley Master
Fixter, A., Boisdale, Guernsey (2).										
Avonview Daphne ..	3309	16.6.36	17	6,609	4·95	327·25	310	Jr. 4	317 ..	Melbourne Sandboy 6th
Runica's Jessie	2163	10.6.36	22	7,871	6·01	473·19	350	Mature	382, 471, 509	Werribee Jessie's Boy
Fixter, W., Boisdale, Jersey (1).										
Olivedale Pearl	41372	23.4.36	31	9,419	4·77	449·66	350	Mature	334, 413, 464	Studleigh Masterpiece
Foster Bros., Boisdale, Jersey (7).										
Boisdale Blonde 2nd ..	51840	16.4.36	10	4,478	5·88	263·27	230	Jr. 2	.. ..	Gladiator of Springhurst
Boisdale Brunette 4th ..	47287	12.5.36	9	4,260	5·78	246·28	270	Jr. 3	246 ..	Gladiator of Springhurst
Boisdale Goldfinch ..	51844	4.5.36	9	3,215	6·00	193·01	230	Jr. 2	.. ..	Boisdale Dazzler
Boisdale Heatherbell ..	51846	26.5.36	8½	4,077	5·01	204·36	230	Jr. 2	.. ..	Boisdale Dazzler
*Boisdale Marjorie 2nd ..	51848	4.5.36	4	675	4·87	32·85	230	Jr. 2	.. ..	Wompini Master Grey
Boisdale Moonshine ..	51849	15.5.36	7½	4,454	5·49	244·57	230	Jr. 2	.. ..	Gladiator of Springhurst
Boisdale Nancy	47294	22.5.36	10	4,472	5·04	225·53	270	Jr. 3	295 ..	Gladiator of Springhurst
Gay, R. G. and Son, North Devon, Jersey (2).										
Elm Grove Daphne ..	39640	4.4.36	23½	7,527	5·73	431·04	350	Mature	334, 381, 420	Melrose Butterman
Myrtle Point Verbena ..	C.R.	11.4.36	19½	6,849	4·89	335·14	250	Sr. 2	.. ..	Werribee Master's King
Gregg, V., Whittlesea, Jersey (1).										
Stoneycroft Plum ..	37438	30.4.36	18	5,823	5·50	320·34	350	Mature	283, 319, 357, 372	Kantara Don Juan
Handbury, J. E. and Sons, Toora, No. 2 Farm, Jersey (3).										
Tooravale Lassie Fowler 4th	28734	3.6.36	12	5,934	4·84	287·03	350	Mature	213, 257, 380, 338	Tooravale Goldspeck
Tooravale Milkmaid 18th	55584	22.6.36	8½	3,432	6·27	215·31	230	Jr. 2	.. ..	Tooravale Goldspeck
Tooravale Starleigh 8th ..	46480	6.6.36	12½	6,459	5·59	361·25	330	Sr. 4	236, 313 ..	Kingsvale Monica 14th Son
Handley, S. C., Dandenong, Jersey (1).										
Barrowby Queen 2nd ..	38809	6.5.36	23½	8,283	5·32	440·85	330	Sr. 4	286, 383, 387	Grangelea Progress
Harvey, T., Boisdale, Jersey (2).										
Jerseyholm Bluebell 17th ..	44478	18.5.36	18	6,185	5·59	346·04	290	Sr. 3	310 ..	Werribee Master's Fox
Jerseyholm Empress 42nd	53359	2.4.36	18½	5,814	5·70	331·45	230	Jr. 2	.. ..	Jerseyholm Master's Expert
Henderson, W., Grasmere, Ayrshire (7).										
Carracoorte Balm 17th ..	27002	22.4.36	8½	5,520	4·07	224·70	310	Jr. 4	318 ..	Carracoorte Gerty's Producer
Carracoorte Brownie 24th	27005	9.4.36	14	4,652	4·12	191·71	310	Jr. 4	252 ..	Carracoorte Gerty's Producer
Carracoorte Bud 7th ..	25904	28.5.36	7½	6,341	4·42	280·24	350	Mature	256, 317 ..	Bluebell's Pride of Glencourt
Carracoorte Fuchsia 9th ..	24691	29.4.36	9½	4,074	4·83	196·92	350	Mature	255, 301 ..	Bluebell's Pride of Glencourt
Carracoorte Gerty 12th ..	Vol. 29	14.4.36	12½	4,887	4·32	210·92	310	Jr. 4	291 ..	Carracoorte Gerty's Producer
Carracoorte Viola 20th ..	25906	7.4.36	15	5,970	4·51	269·41	350	Mature	406 ..	Carracoorte Pilot
†Strathkellar Nymph ..	27754	9.5.36	4	3,630	4·82	174·81	310	Jr. 4	186, 204 ..	Carracoorte Gerty's Producer
Hercus, T. B., Hayanmi, Jersey (1).										
Mologa Trefoil ..	54184	25.6.36	12	4,838	6·05	292·91	230	Jr. 2	.. ..	Belgonia Hinkler
Hore, E., Horefield, Jersey (1).										
Milvue Madeira Chimes ..	54142	2.4.36	10	3,900	5·88	229·22	250	Sr. 2	244 ..	Balcairn Mabel's Master
Huffer, J. A., Gormandale, Jersey (5).										
Glen Valley Fancy Girl ..	28981	1.5.36	18	6,323	5·62	355·15	350	Mature	279, 327, 357, 298	Fancy Rose's Lad of Glen Valley
Glen Valley Handsome Girl	37608	12.5.36	17	5,864	6·13	359·22	350	Mature	323, 320, 344	Melrose Clementine 2nd's Masterpiece
Glen Valley Silver Belle ..	25432	31.5.36	9½	5,606	5·94	333·15	350	Mature	352, 431, 444, 496, 392	Waverley' Count of Glen Valley
Glen Valley Verbena 2nd ..	25433	24.5.36	17½	7,855	5·18	407·05	350	Mature	325, 371, 456, 453, 306, 397	Cream Lad of Mayland
Glen Valley Waverley Lass 3rd	28761	16.5.36	21	7,352	5·74	422·18	350	Mature	280, 301, 402, 356	Cream Lad of Mayland
Hurrey, W. H., Koonwarra, Jersey (1).										
Kooreena Maranta 7th ..	40585	26.6.36	22	7,911	5·95	470·93	330	Sr. 4	313, 402 ..	Columbine's Defiance of Linga Longa

* 90 days in test. † 240 days in test.

Standard Herd Records—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
King, H. W., Warragul, Jersey (2).										
Karoola Freda	37699	15.4.36	23	8,006	5·18	414·52	330	Sr. 4	289 ..	Glenallen Mariposa
Karoola Nancy	Vol. 24	25.5.36	16½	5,139	5·60	287·68	250	Sr. 2	.. ..	Karoola Timekeeper
Leask, G. C., Garfield, Ayrshire (1).										
Wayside Constance ..	28945	13.6.36	23	9,705	3·55	344·79	270	Jr. 3	.. ..	Wayside Winsome's Scott
Longerenong Agricultural College, Dooen, Ayrshire (2).										
Longerenong Acacia Elata	26544	12.5.36	5½	6,011	4·31	259·21	350	Mature	204, 192, 249	Longerenong Baron
Longerenong Laureate ..	26557	30.3.36	15	8,564	4·65	398·30	350	Mature	347, 300, 234	Lily's Lad of Holly Green
Lyon, C. G., Heidelberg, Jersey (9).										
Banyule Molly 48th ..	47121	22.4.36	15	5,763	5·40	311·45	230	Jr. 2	.. ..	Oxford Beau's Pretty Oxford (Imp.)
Banyule Molly 49th ..	47122	26.5.36	13½	4,751	5·53	262·85	230	Jr. 2	.. ..	Oxford Beau's Pretty Oxford (Imp.)
Banyule Silvermine 79th ..	37783	19.5.36	22½	7,254	5·86	424·89	330	Sr. 4	274 ..	Banyule Aero
Banyule Silvermine 89th ..	42891	30.4.36	19	5,981	5·09	304·52	230	Jr. 2	.. ..	Oxford Beau's Pretty Oxford (Imp.)
Banyule Silvermine 90th ..	42892	2.5.36	18	6,119	5·51	336·97	230	Jr. 2	.. ..	Oxford Beau's Pretty Oxford (Imp.)
Banyule Silvermine 92nd ..	47126	9.5.36	15	5,345	5·63	300·76	230	Jr. 2	.. ..	Oxford Beau's Pretty Oxford (Imp.)
Banyule Tiddlewink's 15th	42894	27.4.36	23½	7,826	5·06	395·66	250	Sr. 2	.. ..	Oxford Beau's Pretty Oxford (Imp.)
Banyule Tiddlewink's 3rd	24473	3.5.36	17	8,463	4·73	400·38	350	Mature	460, 472, 426, 514, 416, 431	Air Lord of Banyule
Banyule Tiddlewink's 4th ..	25477	30.4.36	21	6,746	5·80	391·27	350	Mature	317, 479, 368, 327	Air Lord of Banyule
Lyon, W. H., Sale, Jersey (2).										
Avon Blanchette 15th ..	Vol. 24	5.6.36	24	7,619	5·12	390·11	310	Jr. 4	308, 342 ..	Jessie 13th Count of Melrose
Avon Lady Elector 5th ..	37790	11.5.36	15½	6,591	5·50	362·27	350	Mature	331, 334 ..	Jessie 13th Count of Melrose
McDougall, J., Byaduk, Jersey (3).										
Park View Daphne ..	29047	30.4.36	13½	5,069	4·42	223·80	350	Mature	234, 305, 230, 271	Prince of Park View
Park View Shirley 2nd ..	41520	14.4.36	17	6,083	5·41	328·91	310	Jr. 4	230, 349 ..	Grangelea Royal
Park View Charm 3rd ..	41512	28.5.36	19	7,271	4·43	321·98	330	Sr. 4	234, 323 ..	Grangelea Royal
McNabb, G. A. and Son, Irrewillipe East, Jersey (8).										
Maxon Chieftain's Comfrey 2nd	54016	20.4.36	12	3,615	5·55	200·78	230	Jr. 2	.. ..	Maxon Chieftian
Maxon Cornice	40931	17.6.36	15½	5,747	6·73	386·81	330	Sr. 4	387 ..	Maxon Mercedes Chief 4th
Maxon Countess Light ..	49425	19.5.36	20	6,296	6·20	390·29	250	Sr. 2	331 ..	Maxon Count Graceful
Maxon Count's Lodestone	40932	20.6.36	13½	6,071	6·86	416·42	350	Mature	341, 356, 360	Maxon Count Graceful
Maxon Count's Marie ..	49424	18.5.36	18	5,936	5·58	331·23	250	Sr. 2	210 ..	Maxon Count Graceful
Maxon Count's Pearl 2nd	54021	3.5.36	13½	4,497	5·38	242·06	230	Jr. 2	.. ..	Maxon Count Graceful
Maxon Graceful Duchess 2nd	49427	20.5.36	19	6,143	6·38	391·96	250	Sr. 2	282 ..	Maxon Count Graceful
Maxon Noble's Pansy 2nd	54027	26.4.36	13	4,667	5·31	247·61	230	Jr. 2	.. ..	Avalon Noble 8th
Moore, J. and Co., Yarram, Jersey. (4).										
Tooloonook Angler's Belle 2nd	46461	24.6.36	14½	6,407	4·22	270·06	350	Mature	316, 314, 337	Beauty 4th Command of Somerville
Tooloonook Boltonia 5th ..	46463	21.4.36	17	6,003	4·71	282·60	350	Mature	316, 323 ..	Tooloonook Clianthus Hero
Tooloonook Peach 4th ..	46471	22.4.36	13	6,507	4·19	272·84	330	Sr. 4	236, 256 ..	Heroic of Somerville
Tooloonook Virginia 2nd ..	46475	22.4.36	14	5,802	4·99	289·25	350	Mature	178, 230, 333	Tooloonook Carob's Hero
Nicholas, A. M., Estate of the Late, Sherbrooke, Jersey (1).										
Selsey Brown May ..	50566	10.5.36	22½	6,531	6·46	421·96	310	Jr. 4	496 ..	Retford Glider
Nilsson, P. O., Tynong, Jersey (1).										
Yanguren Bluebell's Rose	51368	9.4.36	12	7,751	5·19	402·50	250	Sr. 2	362 ..	Rosyth Romany Prince
Noble, T. M. and Sons, Maffra, Jersey (3).										
Finchley Handsome Lady	37993	19.4.36	26	7,713	7·59	585·59	350	Mature	420, 439, 653	Werribee Lord Burnham
Finchley Handsome Lady 2nd	43886	6.4.36	17½	7,007	6·85	479·74	310	Jr. 4	276, 415 ..	Finchley Lord Harmony
Jerseyinn Nasturtium 2nd	33568	31.5.36	21	8,051	5·66	455·76	350	Mature	337, 421, 357, 423	Werribee Bluebell's Masterpiece
Overend, Mrs. A. C., Sale, Jersey (2).										
Bon Accord Madam Pompadour 5th	C.R.	1.5.36	N.O.C.	4,620	5·81	268·64	230	Jr. 2	.. ..	Tavistock Mystic Prince
Bon Accord Mystic Emma 2nd	C.R.	19.4.36	13½	4,274	5·39	230·38	230	Jr. 2	.. ..	Tavistock Mystic Prince
Payne, A. E. T., Lilydale, Guernsey (1).										
Nundorah Golden Daffodil 2nd	2814	5.4.36	25½	9,159	4·33	396·26	350	Mature	390 ..	Nundorah Golden Sovereign

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving	Milk last day of Test. lb.	Milk lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Pearson, J., Nerrena East, Jersey (4).										
Warrawee Foxglove ..	51130	28.4.36	4	6,164	4·83	297·96	290	Sr. 3	304 ..	Warrawee Trumpeter
Warrawee Pearl	55793	17.5.36	4	5,256	5·16	271·35	230	Jr. 2	.. ..	Warrawee Trumpeter
Warrawee Ruby ..	51133	15.6.36	4	5,154	5·37	276·62	310	Jr. 4	294 ..	Banyule Tympani
Warrawee Soprano ..	51134	28.5.36	4½	4,599	5·64	259·22	310	Jr. 4	325, 291 ..	Banyule Tympani
Phillips, J. H., Speewa, Jersey (1).										
Kantara Musk	26202	28.5.36	20	7,689	4·98	382·66	350	Mature	330, 370, 436, 443, 428	Kantara Great Gun
Powell, T. S., Mansfield, Jersey (5).										
Monterey Maid's Mermaid	Vol. 24	24.6.36	23½	8,286	5·33	442·03	230	Jr. 2	.. ..	Rosecliffe Mariposa's Master
Monterey Mariposa's Lark	49603	20.4.36	19½	5,925	5·98	354·55	250	Sr. 2	.. ..	Rosecliffe Mariposa's Master
Monterey May's Fancy ..	Vol. 24	17.4.36	20½	5,840	5·20	303·85	230	Jr. 2	.. ..	Rosecliffe Mariposa's Master
Mornmoot Maid	33125	26.5.36	13	8,208	5·69	466·84	350	Mature	318 ..	Choirmaster of Banyule
Warenda Charmain 4th ..	29149	6.6.36	24	8,006	5·70	456·48	350	Mature	.. ..	Kinnor of Banyule
Raleigh, Miss H. E., Pakenham Upper, Jersey (2).										
Goronga Farm Aviation ..	53001	9.5.36	19	5,877	5·41	318·10	250	Sr. 2	.. ..	Goronga Farm Avro Avian
Mornmoot Modiste 2nd ..	33140	2.6.36	20½	6,147	5·75	353·45	350	Mature	360, 411, 453, 408	Werribee Prince Madeira
Read, J. D., Springhurst, Jersey (18).										
Springhurst Alsyke 4th ..	29329	24.4.36	16½	6,759	6·16	415·58	350	Mature	303, 406, 456, 514, 473, 468	Starbright's Prince of Glen Iris
Springhurst Angelica Tecoma	50619	5.5.36	18½	6,872	6·08	417·85	250	Sr. 2	359 ..	Bellefaire Seaborn Successor
Springhurst Blonde Aconite	50622	17.5.36	21½	8,171	5·34	436·38	230	Jr. 2	.. ..	Bellefaire Seaborn Successor
Springhurst Blonde Alsyke	50623	22.4.36	12½	4,526	5·94	268·96	230	Jr. 2	.. ..	Bellefaire Seaborn Successor
Springhurst Blonde Tecoma	46179	30.3.36	19	6,854	5·82	398·59	250	Sr. 2	363 ..	Bellefaire Seaborn Successor
Springhurst Blonde Tomato	46180	29.3.36	21½	6,965	5·96	415·18	250	Sr. 2	379 ..	Bellefaire Seaborn Successor
Springhurst Brinjal ..	46181	27.4.36	21½	7,956	6·18	491·95	290	Sr. 3	356, 447 ..	Bellefaire Seaborn Successor
Springhurst Coronation Narcissus	50625	10.4.36	18½	5,741	5·52	317·00	230	Jr. 2	.. ..	Springhurst Design Analyst
Springhurst Coronation Nightshade	46183	5.4.36	24	8,424	5·65	476·35	310	Jr. 4	376, 411 ..	Design's Ruler (Imp.)
Springhurst Design's Lily ..	55275	13.5.36	18½	5,838	5·12	298·65	230	Jr. 2	.. ..	Springhurst Design's Analyst
Springhurst Hussy Alsyke	50630	27.5.36	13	4,497	6·33	284·50	230	Jr. 2	.. ..	Bellefaire Seaborn Successor
Springhurst Soya ..	38107	23.4.36	21	7,431	5·30	393·48	350	Mature	366, 415, 432	Starbright's Prince of Glen Iris
Springhurst Sybil Narcissus	46191	2.6.36	30	10,820	5·02	543·23	290	Sr. 3	369, 534 ..	Bellefaire Seaborn Successor
Springhurst Sybil Nerine ..	46192	3.4.36	25	8,856	6·13	543·29	270	Jr. 3	461 ..	Bellefaire Seaborn Successor
Springhurst Sybil Soya ..	50634	27.4.36	20½	7,535	5·20	391·73	230	Jr. 2	.. ..	Bellefaire Seaborn Successor
Springhurst Sybil Tecoma	46193	2.5.36	20	7,824	5·06	396·03	290	Sr. 3	333, 392 ..	Bellefaire Seaborn Successor
Springhurst Sybil Tomato	46194	14.4.36	28	9,234	5·37	496·19	290	Sr. 3	431, 520 ..	Bellefaire Seaborn Successor
Tomato of Springhurst ..	18939	22.5.36	26½	8,688	5·28	458·30	350	Mature	302, 533, 604, 567, 594, 563, 544, 495, 448	Alloy of Banyule
Rentsch, A., Tabor, Australian Illawarra Shorthorn (2).										
Allawalla Model 2nd ..	8675	13.6.36	4½	7,847	3·57	279·86	350	Mature	287, 203, 270	Premier of Fairfield
Alne Bank Marjory 2nd ..	8721	5.6.36	12	5,886	4·14	243·64	290	Sr. 3	307 ..	Alne Bank Dolly's Gift
Richardson, W. S., Bacchus Marsh, Jersey (2).										
Ayton Law Noble Silvie 2nd	42840	16.4.36	14½	5,342	6·43	343·52	350	Mature	203, 243, 196	Wagga Yambil's Goddington Noble
Clarendon Eyre Rose Marie 5th	43392	5.4.36	17	5,466	6·17	337·29	330	Sr. 4	401, 418 ..	Clarendon Eyre Eminent's Achievement
Salesian College, Sunbury, Ayrshire (3).										
Mount Noorat Poppy ..	24148	27.5.36	12	6,651	3·96	263·38	350	Mature	294, 364, 272	Sparrovale Brilliant
Rupertswood Alice ..	26721	7.5.36	22	6,720	4·14	278·00	330	Sr. 4	257 ..	Billy of Rupertswood
Rupertswood Thora ..	C.R.	17.5.36	N.O.C.	5,447	4·09	222·61	250	Sr. 2	.. ..	Scotswood Bellboy
Sebire, T., Wandin Yallock, Jersey (2).										
Wandin Butterfat ..	55754	15.6.36	16	6,246	5·75	359·37	230	Jr. 2	.. ..	Leven Brae Kingdom
*Wandin Flower	55756	5.5.36	4	3,975	5·13	203·88	290	Sr. 3	.. ..	Lilac's Superior of St. Albans
Shearman, A. and W., Darnum, Jersey (2)										
Darnum Park Perfection ..	C.R.	13.6.36	6½	4,328	6·69	289·34	250	Sr. 2	.. ..	Oak Park Goldfinder
Darnum Park Eminence ..	C.R.	15.6.36	20	6,956	5·19	361·21	230	Jr. 2	.. ..	Darnum Park Starbright's Masterpiece
Stephens, Dr. F. G., Vermont, Guernsey (2).										
Vermont May Belle ..	5187	7.6.36	17	7,443	4·64	345·45	250	Sr. 2	.. ..	Majestic of King's Mills
Kentdale Kathleen ..	4312	3.4.36	13½	6,225	5·45	339·16	270	Jr. 3	242 ..	Kentdale Tomboy
Taylor, C. G., Highton, Jersey (1).										
Maindale Jeanette ..	37895	16.6.36	4½	7,679	5·13	393·80	350	Mature	431 ..	Rosedale View Maid's King

* 210 days in test (sold).

STANDARD HERD RECORDS—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	Milk last day of Test. lb.	Milk lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Thomas and Taylor, Hamilton, Ayrshire (7).										
*Carracoorte Bellona 14th	23542	5.5.36	4	6,210	4·18	259·68	350	Mature	230, 350, 396	Gerty's Producer of Carracoorte
Carracoorte Betsy 25th ..	28166	11.6.36	19	7,257	4·37	317·33	290	Sr. 3	305 ..	Carracoorte Panic
Carracoorte Fennella 15th	24688	26.6.36	16	6,889	4·78	329·63	350	Mature	273, 359 ..	Gerty's Producer of Carracoorte
Carracoorte Lillian 7th ..	27012	13.5.36	20	6,162	4·74	292·34	290	Sr. 3	341 ..	Carracoorte Panic
Carracoorte Pearl 12th ..	28177	17.4.36	26	6,932	4·55	315·08	290	Sr. 3	302 ..	Grand View Bernie
Jennewar Bonnie ..	27421	11.6.36	19½	7,167	4·80	344·12	290	Sr. 3	341 ..	Carracoorte Panic
Jennewar Fairy	Vol. 29	25.5.36	13	4,302	4·96	213·29	250	Sr. 2	.. ..	Carracoorte Opperman
Tomasetti, B. G., Drouin West, Ayrshire (3).										
Glencorren Hall Mark ..	C.R.	9.4.36	17	4,908	4·29	210·41	230	Jr. 2	.. ..	Scotswood Michael 2nd
Glencorren Margaret ..	28446	10.6.36	21	7,218	4·37	315·43	290	Sr. 3	303 ..	Scotswood Michael 2nd
Glencorren Molly ..	C.R.	4.5.36	17½	5,106	4·18	213·50	230	Jr. 2	.. ..	Scotswood Michael 2nd
Vagg, E. J., Leongatha, Jersey (2).										
Bonnay Mystery's Cynthia	51868	22.5.36	15	5,205	5·43	282·51	250	Sr. 2	.. ..	Jerseyinn Edith's Masterpiece
Jerseyinn Edith 2nd ..	38450	15.5.36	37	13,146	5·71	750·25	350	Mature	438, 608, 678	Werribee Bluebell's Masterpiece
Wade, W. J., Stratford, Jersey (1).										
Hazeldale Ruby 2nd ..	25555	1.4.36	13	6,404	4·69	300·31	350	Mature	294, 326, 252, 422, 448, 376, 327	Dinkum of Banyule
Walker, C. S., Swan Hill, Jersey (4).										
Gum Park Cream Lass ..	44232	11.4.36	16¼	6,204	4·86	301·79	290	Sr. 3	266, 265 ..	Starlight of Bellaire
Warwick Augustus Marie 4th	C.R.	29.5.36	17½	5,373	5·00	268·53	250	Sr. 2	.. ..	Glen Iris Golden Lord
Warwick Polly 4th ..	C.R.	15.6.36	10	4,913	5·39	264·87	250	Sr. 2	.. ..	Glen Iris Golden Lord
Warwick Princess Irene ..	38489	16.6.36	19	6,787	4·67	316·76	350	Mature	305, 363, 317, 293	Chevrolet of Banyule
Wallace, A., Bendigo, Ayrshire (2).										
Kilbracken Promise ..	24076	18.5.36	19	6,395	3·97	253·95	330	Sr. 4	.. ..	Glen Cooee Charlie Chaplin
†Kilbracken Welcome ..	24078	6.4.36	4	3,630	4·41	160·23	350	Mature	.. ..	Toolleen Hero
Wood, J. V. M., Heidelberg, Jersey (2).										
Clarendon Eyre Belladonna 5th	52250	4.4.36	19	5,737	5·11	293·03	230	Jr. 2	.. ..	Clarendon Eyre Eminent's Achievement
Clarendon Eyre Little Buttercup 2nd	29624	19.6.36	24	9,687	5·27	510·54	350	Mature	370, 435, 497, 521, 497, 479	Clarendon Eyre Rose's Eminent

* 240 days in test. † 180 days in test.

Re-working, Grafting and Budding of Deciduous Fruit Trees

(*Continued from page* 286).

"*Ring*" *or* "*annular*" *budding* is done by cutting out a complete ring of bark from the scion, with a bud in the centre. A ring of similar width is cut from the stock and the bud ring fitted into the vacant space. Tying and sealing follow.

"*Flute*" *or* "*Patch*" *budding* is performed by cutting a square of bark from the scion, in the centre of which is the bud. A small flute or patch of bark of similar area is removed from the stock, into which the scion patch is fitted. It is then tied and sealed.

"*Chip*" *budding* is practised by cutting out a small square or oblong of wood with a bud in the centre. A similar sized space is cut from the stock into which the former is fitted. The ends of the "chip" and also the ends of the stock opening may be bevelled to fit, if thought necessary. This, too, must be tied and sealed. This method may be varied by taking a small spur or twig in place of the bud.

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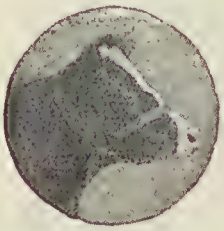

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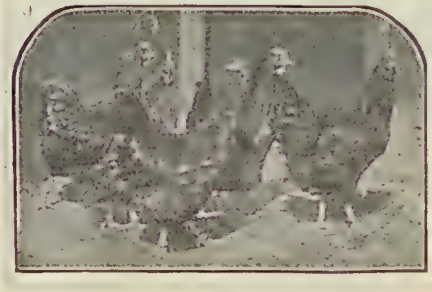

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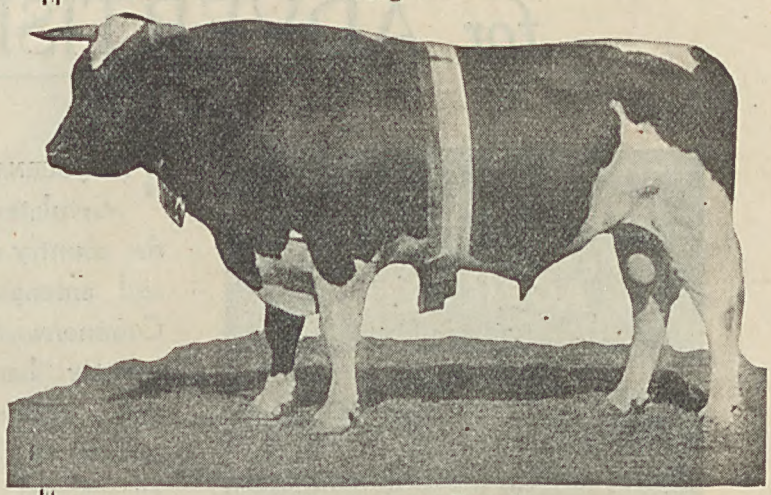

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Sire: Victoria Double Top (1354) *Dam:* Victoria Contralto (5106)
Victoria Contralto produced 305 lb. butter-fat in 240 days as Sr. 3 year old.
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2. **VICTORIA SINGING LAD** (C.R.) *Born 10th October, 1936*
Sire: Rupertswood Inka Jo. (1732) *Dam:* Victoria Songstress (3768)
Victoria Songstress produced 468 lb. butter-fat in 273 days.
Price: **17 guineas** f.o.r. Werribee

3. **VICTORIA VISCOUNT** (C.R.) *Born 24th October, 1936*
Sire: Rupertswood Inka Jo (1732) *Dam:* Victoria Joyous Piebe (3259)
Victoria Joyous Piebe has produced 546 lb. butter-fat in 273 days.
Price: **20 guineas** f.o.r. Werribee

4. **VICTORIA CONDUCTOR** (C.R.) *Born 13th January, 1937*
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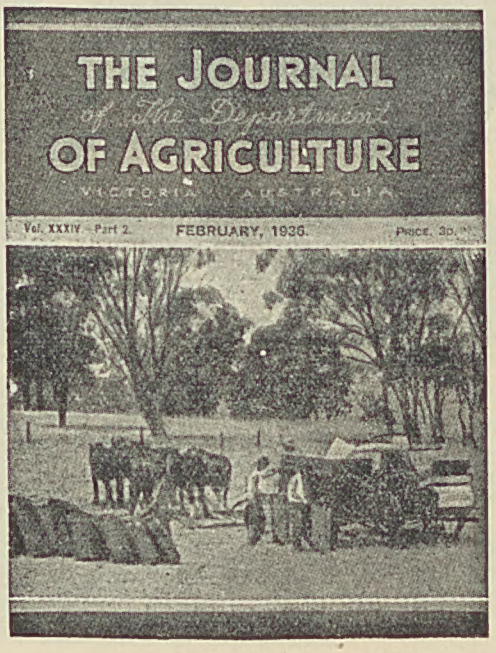

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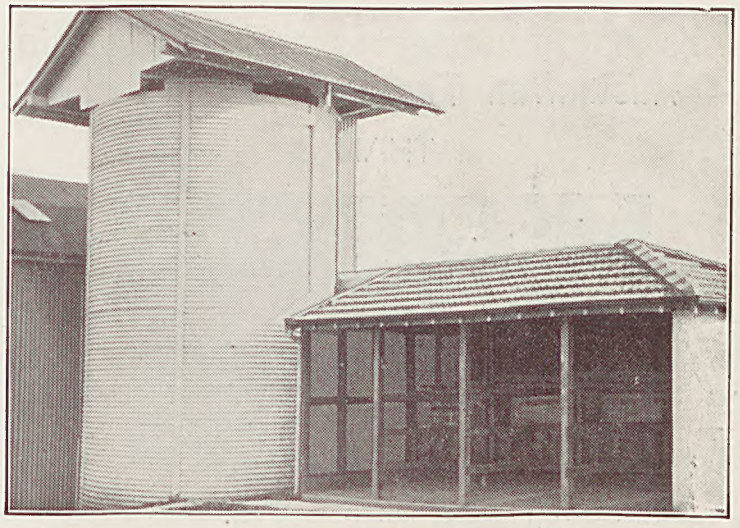

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